THE RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer · TRANSPORT · The Railway News
The Railway Times · Herapath's Railway Journal · RAILWAY RECORD.
RAILWAYS ILLUSTRATED · ESTABLISHED 1835 · Railway Official Gazette

33, TOTHILL STREET, WESTMINSTER LONDON, S.W.1

Telephone : WHitehall 9233 (20 lines) Telegrams : "Trazette Parl London"

BRANCH OFFICES

GLASGOW : 139, Bothwell Street, C.2 . . . *Central 4646*
NEWCASTLE-ON-TYNE : 21, Mosley Street . . *Newcastle-on-Tyne 22239*
MANCHESTER : Century Insurance Building, St. Peter's Square *Central 7667-8-9*
BIRMINGHAM : 90, Hagley Road, Edgbaston . . *Edgbaston 2466*
LEEDS : 70, Albion Street . . . . . *Leeds 27174*
BRISTOL : 20, Victoria Square, Clifton . . . *Bristol 33873*

Annually £5 by post Single copies, Two shillings
Registered at the G.P.O. as a newspaper. Entered as second-class matter in U.S.A.

Editor : B. W. C. Cooke, Assoc. Inst. T.

Vol. 113] FRIDAY, OCTOBER 21, 1960 [No. 17

CONTENTS

	PAGE
Editorial Notes	465
Parliamentary Debate	467
The Railway Image	467
The Torshear Bolt	468
Service to Exporters	469
Locomotive Developments for 25k-V System ...	469
Letters to the Editor	470
The Scrap Heap	471
Overseas Railway Affairs	472
Publications Received	473
All-Welded Bridge at Dan-y-Graig, Western Region	474
Luxury Trains for Sydney—Melbourne Service ...	476
Electric Traction Section	477
Personal	487
New Equipment and Processes	489
News Articles	491
Contracts and Tenders	493
Notes and News	494
Railway Stock Market and Official Notices ...	496

The Breeziest of Them All

SPEAKING at Scarborough last week, Mr. Ernest Marples, the Minister of Transport, commented on the "very breezy intervention" of Mr. W. Manning, "the N.U.R. man," whom Mr. Marples described as "breezier than most." Mr. Manning had asked that the Government would give railwaymen "the right wage." In reply, Mr. Marples said that the Government had done that, and went on to show that he could out-breeze any member of a railway trade union. He also showed that he considers himself to be not a Minister of Transport, but a Minister of Roads. He asked whether co-ordination of road and rail was supposed to mean that traffic now on the roads should be forced back to rail : if that were done, congestion in the towns would not be altered. If goods were sent from Manchester to London, they would be collected in Manchester by road, then they would go to the railway station by road ; then on a truck, double-handling, to the marshalling yard, then the London marshalling yard, then the London depot, and finally to a house by road. Mr. Marples seemed rather pleased to be able to state that, for the first time in the history of this country, the railways were taking less than 50 per cent of the total traffic. While admitting that "railways have a part to play," he thought that if one moved "big things like minerals, coal, iron, and so on by rail," it would not ease congestion in the towns. When one sent something by rail, one often lost little bits on the way : he once had an unfortunate experience when he sent a derrick with all its gantlings by rail, a small part came adrift and he lost £3,000 a week on site. He got no compensation except a very nice letter. We are not surprised that Mr. Marples was treated with courtesy: during the whole of our lengthy contact with British Railways—a length of contact which the Minister of Transport unfortunately does not share—we have invariably been treated courteously, even when our views differed from those directing current railway policy, and there is little doubt that Mr. Marples' present views differ very widely indeed from established railway policy anywhere in the world. It is a pity that, on the one occasion on which he used rail transport, the Minister suffered damage. This might have been because he failed to pack his goods carefully enough, or it might have resulted from one of those misfortunes which periodically beset even the best-run railway. In any event, the duty of a Minister is to be objective—not objectionable.

Mr. A. E. Tattersall

THE signalling career of Mr. A. E. Tattersall, who died on September 27, covered a wide field of experience ranging from manual signalling on the Great Southern & Western Railway of Ireland to colour-light signalling on the L.N.E.R. main line between York and Northallerton. He was responsible for the installation of all-electric power and automatic signalling on the Metropolitan Railway, and was connected with automatic signalling on the East London Railway. Later he played an important part in the development of signalling in this country when he supervised the introduction of approach lighting, intermittent track circuiting for the control of single line, and the extended use of mechanical colour-light signals in the North Eastern Area of the L.N.E.R., and the installation of carrier way telephony and modern teleprinters between York and Newcastle. He was subsequently responsible also for the conversion of most of the Southern Area telegraph trunks to a teleprinter network and for the automatic switching connected with it. His success in the training of staff was outstanding, and he was the author of two standard signalling manuals. He was a frequent contributor of papers to learned societies, and was awarded the Webb Prize by the Institution of Civil Engineers for his paper on "Railway Signalling and Communications." Biographical reference is made to his career in our personal columns.

Britain's Tourist Industry

ALTHOUGH one dissident voice deplored the lack of representation in the British Travel & Holidays Association of outstanding organisers such as Mr. Charles Clore or Sir Simon Marks, the general atmosphere of the Association's thirty-first annual general meeting was optimistic. The President, the Duke of Richmond & Gordon, drew attention to the improvement which was taking place in the national standard of cooking and in the accommodation provided by the increasing number of hotels. Speaking as Chairman for the last time—he is retiring and will be succeeded by Sir William Mabane, formerly a Privy Councillor and now the holder of several important directorships—Sir Arthur Morse said that 1959 had been a bumper year for British tourism. Overseas visitors had numbered 1,395,000 and were expected to total 1,600,000 during the current year. Receipts, including fares, should amount to £250 million. The Association's annual "Come to Britain" trophy had been won this year by the Friends of Norwich Cathedral for their presentations at the cathedral of *Son et Lumiere*, and six other entrants had been awarded certificates of commendation.

C.T.C. Extended in New Zealand

FURTHER C.T.C. installations brought into use by New Zealand Government Railways in the North Island have increased the route mileage so equipped from 243 to 276. In May the Porirua-Paekakariki section controlled from Wellington and the Paekakariki-Paraparaumu section controlled

from Paekakariki were brought under control of the Wellington operator, except for the local Paekakariki interlocking, and were extended northward 10 miles to Te Horo. The total length now controlled from Wellington is 29 miles, but this will be reduced to 26½ when double-line working is extended northward from Porirua to Mana on November 7. From July 11, C.T.C. operation was introduced over the nine miles between Palmerston North and Ashhurst, and from August 14 an installation came into use east of Tauranga. The latter covers a 4½-mile section between Edgecumbe and Awakaponga and the nine-mile branch line to Kawerau. Operated from Edgecumbe, the main purpose of this installation is to safeguard train working over the junction at Hawkens, one mile east of Awakaponga. The equipment was supplied by Associated Electrical Industries—G.R.S. Limited, Siemens & General Electric Railway Signal Co. Ltd., and Westinghouse Brake & Signal Co. Ltd.

Overseas Railway Traffics

OPERATING revenues of the Canadian National Railways for the month of August, 1960, amounted to $58,316,000. Expenses, taxes, and rents totalled $61,475,000 resulting in a net operating income deficiency for the month of $3,159,000. In August, 1959, operating revenues were $61,525,000; expenses, taxes, and rents were $62,671,000 and the net operating income deficiency was $1,146,000. The aggregate net operating income deficiency for the period January 1 to August 31 was $13,976,000 ($2,108,000). East African Railways & Harbours approximate railway revenue for the month of August amounted to £1,681,000, an increase of £9,000 compared with August of last year. The greater part of this increase was brought about by improved goods traffic receipts, which at £1,318,000 were £43,000 higher than the previous year. In addition, there were small increases of £600 in receipts from passenger and other coaching traffic and £1,200 from livestock services. Salvador Railway Company receipts for July amounted to colones 137,000 compared with colones 160,000 last year, a decrease of colones 23,000.

Timetable Control of Junctions

A FURTHER development of the automatic control of junctions by the use of programme machines is being put into operation on the London Transport Executive District Line. The machines are basically the same as those introduced on the Northern Line and at Watford on the Metropolitan Line in 1958, but important new features have been included in the present installation. The identification of all trains on the programme rolls is now by train number. This is punched on the roll in the form of a decimal-binary code used for reference purposes. The programme rolls have space at the right-hand side for eight columns of punched holes. Instead of using these eight holes as one group according to the normal binary method of counting, each row is split into three groups on the decimal-binary system; the first three holes from the right indicate the units; the next three, tens; and the last two, hundreds. The eight holes yield only 255 separate numbers whether used for normal binary code or on the decimal-binary system, but the use of the decimal system requires fewer relays in de-coding units and enables numbers to be read more easily by eye from the programme rolls.

Traffic Created by Kent Coast Electrification

ELECTRIFICATION by the Southern Railway in the 1930's of its main lines to Brighton and other towns on the Sussex coast increased residential traffic from and to the coastal resorts and intermediate points and resulted in considerable housing developments. The number of passengers is still growing. Completion last year by the Southern Region, British Railways, of conversion between Gillingham and Dover *via* Canterbury East, serving, amongst other communities, coastal towns between Whitstable and Margate and Ramsgate, has had similar results. The Region is now extending electrification from Sevenoaks and from Maidstone East *via* Ashford to Folkestone, Dover, and Deal and to Thanet *via* Canterbury West, and from Maidstone West to Paddock Wood. That equal success may be expected is clear from the statement last week by Sir Philip Warter, Chairman of the Southern Area Board of the British Transport Commission, that at Folkestone which, he states, was a dead town five years ago, "every inch of building is now bought at a high price." The present steam and diesel services from and to Folkestone are good, but increases in speed and frequency will result from electrification. Sir Philip Warter also stated that it was hoped to introduce electric traction between Waterloo and Bournemouth, and Weymouth and Salisbury in the next four years, and to "abolish the steam engine east of Salisbury."

Swindon Diesel Test Plant

THE comprehensive testing of new and rebuilt diesel engines for railcars and locomotives with mechanical or hydraulic transmissions requires a different technique to that generally applied to diesel-electric equipment in which the output can be measured electrically either on the test bed or while the unit remains *in situ*. The plant needed for brake testing with the same accuracy and efficiency achieved by engine manufacturers is becoming a common element in the essential equipment of large railway works. The placing of a contract by British Railways, Western Region, with Heenan & Froude Limited for two DPY5 dynamometers to be installed for testing railcar engines at Swindon, as recorded in our Contracts and Tenders section, is indicative of this trend. Although each equipment will be capable of absorbing and measuring up to 650 b.h.p. at speeds up to 3,500 r.p.m., because of rotational speed limitations currently applying to rail-traction diesels, it is unlikely that this installation will be called on to test any power greater than about 400 b.h.p. for some years to come. For testing the higher-powered engines and transmissions of Type "4" diesel-hydraulic locomotives at Swindon, two test cells are already being supplied by Heenan & Froude Limited to an earlier order.

Further Electrification in Spain

COMPLETION on September 30 of extension of electrification at 3,000V. d.c. between Alcazar de San Juan and Santa Cruz de Mudela, part of the Spanish National Railways main line from Madrid to the South, has resulted in the longest continuous electrified section in Spain, from Alcazar to Cordoba, 183 miles. This conversion, diesel traction south of the electrified section, re-laying of the track between Madrid and Seville and Cadiz, and re-signalling and installation of C.T.C. on the Linares-Lora del Rio and Seville-Cadiz, have made possible acceleration of passenger services between Madrid and Andalusia. Haulage of passenger and goods trains on the electrified section is by 3,000-h.p. Bo-Bo-Bo locomotives of the "7800" class, built by the Westinghouse Electric Corporation in conjunction with the Sociedad Española de Construcción Naval. Whether it is intended to electrify between Madrid and Alcazar, 92 miles, or from Cordoba to Seville, 82 miles, has not yet been announced but there seem to be other more heavily-graded sections for which priority would be given in an electrification programme notably in the north of the country.

The Settle Accident

ONE can sympathise with the driver in the Settle accident on January 21 last, on which the Chief Inspecting Officer of Railways, Brigadier C. A. Langley, has issued his report summarised on page 491. Although it was not unusual for slide-bar bolts to work loose in the "Britannia" Pacifics, it certainly was unusual for two slide-bars to fall off; and in a snowstorm at 2 a.m. at an open elevation of 1,000 ft. or more, it is understandable that a driver looking for hot bearings, and anxious not to delay his train, should miss the disappearance of the right-hand bottom slide-bars. Attention has been drawn to the technical origins of this accident, but the cause of the lost lives and all the damage away from the locomotive was a second factor, and that was the co-incident passage of a goods train in the opposite direction, which was derailed because of damage done to its track by the semi-detached crosshead and rod, and which ripped open the first three coaches of the passenger train. The "Britannia" Pacific locomotive was not even derailed. There must be comparatively few accidents which are caused by only one default or factor.

Brigadier Langley points out that difficulty in reaching parts of the locomotive can result in slack maintenance as exemplified by this accident.

Rolling Stock Maintenance at Ashford

EXTENSION of electrification to Ramsgate and Dover, British Railways, Southern Region, last June made it necessary to provide additional repair and inspection facilities for the multiple-unit electric stock. Although much has been done in the way of new construction and conversion of steam sheds, it was apparent that a new repair shop with further inspection facilities would be necessary to cope with new stock now being built at Eastleigh for the second phase of the electrification scheme. Fifty-nine express electric units of four cars each are under construction for this part of the scheme which will carry electrification through to Folkestone and Ramsgate *via* Ashford. The new repair shop being built near Ashford will enable the overhauling of 300 four-coach units, both electric and diesel electric, to be carried out each year, while the inspection shed will contain four pitted roads each capable of accommodating a four-coach unit.

Parliamentary Debate

WITH the re-assembly of Parliament next Tuesday, the searchlight will be thrown on transport, for a full-scale debate is scheduled for October 26. Members will have much to discuss, as they will have before them not only the report and accounts of the British Transport Commission for 1959, but also the report of the Select Committee on Nationalised Industries on Railways and the evidence taken before it. Since the first two were published before Parliament adjourned for the long summer recess, M.P's will have had ample time to digest these meaty documents; and the Government, having also received some recommendations from the Special Advisory Group on the B.T.C. (the Stedeford Committee), by now should be able to indicate its views on how it considers the Commission should be shaped to meet the future. In particular, three inter-related matters call for decision: first, the future of the modernisation plan, including the extent to which electrification should be proceeded with ; second, the future administrative pattern, including the question of regional autonomy; and, third, the financial position of the Commission.

No doubt, on all these the Stedeford Committee has had something to say. It is most important, therefore, that the Government cease being reticent in conveying its views on them to Parliament. From the outset, the view has been expressed in these columns that the appointment of this committee with powers of investigation behind closed doors meant in effect that it could act as both judge and jury, and that the Commission was precluded from stating its case in public, especially as the Government has consistently refused to commit itself to publishing the report of the Committee. This makes Wednesday's debate of particular importance ; it should enable Parliament to express its views on the recommendations before the Government acts on them.

If, however, the reports are correct that the Committee favours cutting-back the modernisation plan, and particularly the electrification programme, then it is essential that Parliament be given all the facts to enable the most careful consideration to be given to them before hasty decisions are made. Unfortunately, the Select Committee can be called in support by those who would go slow on electrification and prefer the alternative of dieselisation; but the evidence, to which reference was made in our October 17 issue, does not substantiate this view. It merely reveals that the costs of the London Midland electrification main line were far higher than had been estimated and that the Government itself did not consider the economics of the alternative. In regard to that, however, it can be argued that such decisions are for the technicians and not for politicians or civil servants. The recent British Railways Electrification Conference should be proof enough that decisions to electrify were not lightly taken and that technically the British Railways are in the front in this field. All the conditions justifying this form of traction are present as far as the London Midland scheme is concerned : dense, heavy, and frequent traffic. Experience so far has shown that where these conditions prevail electrification generates additional traffic and is economically justified. Parliament should not, therefore, be talked into accepting a short-term view and retreating from the present electrification plans in the hope of immediate economies which there is every indication would in the long-term prove to be false economy.

As to regional autonomy, for reasons which may be more sentimental than practical, M.P.'s have shown a hankering after the segregation of the Regions of British Railways into separate entities; but while the maximum degree of regional decentralisation consistent with efficient operation of the railway system as a whole may be desirable, it is hard to appreciate just what lasting benefits could be derived from financial autonomy and the operation of the Regions as separate systems. Certain of them, the Scottish Region, for instance, could never be economically viable ; and to allocate revenues accruing from inter-Regional working would of necessity be administratively cumbersome as well as expensive, and some of the benefits that flow from centralisation might be lost. Here again, therefore, no hasty decision should be made.

In regard to the Commission's finances, future results will be influenced by the decisions taken on these two questions of modernisation and administration. The Commission faces a record deficit for the current year which Parliament must meet, as railway losses are now a direct charge on the taxpayer. This cannot be allowed to continue indefinitely, and once the modernisation programme approaches completion, and the future administrative pattern has been determined, a once-for-all capital readjustment will be necessary to enable the Commission to pay its way on a reconstructed capital structure.

Wednesday's debate is of more than usual importance to to the future of the Commission. It is to be hoped that it will be conducted on the highest level and rise above party political considerations, so that the Government will be guided as to the action that it should take to enable British Railways to be operated outside of the political atmosphere, and to assist in the restoration of the morale of all those responsible for their operation, administrative and operational staff alike.

The Railway Image

THE general picture, or " image " of the railways in the public mind, the purpose which the railways should serve in the national life, and how this purpose is achieved ; some of the consequences of the picture ; and the action which should be taken are the theme of the comprehensive Presidential address given last Wednesday to the Railway Students' Association at the London School of Economics by Mr. J. R. Hammond, General Manager of the Western Region, British Railways. As to the image of the railways in the public mind, he does not comment on the notion entertained by the minority which seriously thinks that railways are outmoded, except to say that it has no significant support in the country, particularly among those most qualified to judge. Regarding the function of railways in relation to road and other forms of transport, he emphasises that in terms of ton-miles and passenger-miles, the railways " make a massive contribution " to national life ; an undertaking which runs 17,710 million ton-miles and 22,270 million passenger-miles a year is a long way from expiry. The vast majority of traders, Mr. Hammond states, is " satisfied with our services."

Dealing with the problem of the " bad press " so often experienced by railways, he stresses that bad transits and poor passenger train timekeeping are " news," and that a relatively small proportion of poor services can destroy or distort the image, in the public mind, of railway efficiency. Labour troubles on the railways, whatever their cause, engender a feeling of uncertainty as to the reliability of railway services, and even the threat of labour trouble causes traders to look elsewhere for their transport, which often cannot be arranged on a short-term basis, so that traffic is lost for some time or perhaps for good. A further factor which helps to colour the railway picture is the mounting annual deficits. The establishment by the Government of the Special Advisory Group on the organisational and financial structure of the British Transport Commission and the report of the Select Committee, however commendable in themselves, tend to heighten the feeling of uncertainty as to the future of the railways. Mr. Hammond adds that in fairly recent months considerable publicity has been given to road development and the public obtains a further impression—however false—of a material change of emphasis in the overall transport outlook. The balanced view

is that each form of transport must receive the support necessary to enable it to discharge its proper function in the interests of the national economy. The fact is that the picture of British Railways in the public mind is not satisfactory, and no good is achieved by trying to ignore this. One of the most serious results of this unsatisfactory feature is its effect on staff morale. Mr. Hammond does not suggest that everything can be put right by better information services and by improving internal channels or communications, or that public relations are a substitute for good service.

Where there are difficulties, they must be faced. For example, one of the most difficult spots in operations at the moment is in the Midlands, where both the London Midland and Western Regions are suffering an acute shortage of key staff. In this case, the General Manager of the London Midland Region, Mr. David Blee, and Mr. Hammond decided on exceptional measures which have involved very hard work by a large investigating staff. As a result, there has been much improvement in the position though much remains to be done. Many problems will not be solved until modernisation is completed ; meanwhile, Mr. Hammond is quite certain that there is a great deal that can be done to improve services ; and stationmasters, goods agents, yardmasters and supervisors, besides district officers, can and must play a key part at each level.

Considerable emphasis has been placed on experience in the railway industry, but at a time of almost elemental change, he maintains at least equally important are : (a) willingness to test existing traditions ; (b) capacity to re-think existing practices and processes in relation to present and future requirements, and the availability of new techniques and equipment, (c) flexibility of mind in regard to the place of railways in the whole scheme of transport, and (d) a communicable enthusiasm for necessary changes.

These qualities are the mainspring of much recent research under the leadership of the British Transport Commission. One example is work study techniques. The confidence of the pioneers in this field, Mr. Hammond shows, has been amply justified. It was realised that there must be an unremitting search for improved methods in every sector of railway activity and for maximum utilisation of equipment and staff. To date, some 32,000 of British Railways staff have been covered by work study investigations, the largest total covered by work study schemes in any single organisation in Europe. This, however, amounts to only 6 per cent of the total British Railways' staff, so that only a very encouraging start has been made. Rapid progress has been made on the civil engineering side and pilot work study schemes have been developed covering practically all the various operations which affect railway services. Extension may be expected of schemes throughout all operations on British Railways covering activities on both the passenger and freight-carrying sides ; engineering ; stores ; maintenance work ; and the administrative and office field. Such expansion, involving fundamental changes in methods and planning, calls for an intensified " selling " programme and it is here that the " communicable enthusiasm " of management at all levels will pay off. Much of the routine work, such as paybills, stores accounting, traffic audit and analysis and statistics, is already covered by the more simple type of electronic calculators; but the use now can be envisaged of computers in applications such as timetabling and wagon control, with considerable savings in the empty movement of rolling stock and the improvement of services. A scientific type computer is being increasingly used by the engineering departments, notably for calculating stresses in bridges and other structures.

Other examples of research to be undertaken are: first, replanning of passenger services; elimination of those which are unremunerative and are better covered by alternative means of transport; and the scientific arrangement of schedules, which, whilst improving the service when traffic justifies this, ensures economic utilisation of staff and of the expensive equipment which is being provided under modernisation. Secondly, there must be re-orientation of goods traffic policy. Already modern marshalling yards have been planned and some built ; the concentration of freight terminals is under way and a further stage is the progressive planning of freight schedules.

As to co-ordination of rail and road services, Hammond points out it is clear that for a great proportion of heavy traffic the railway is the proper agency for the trunk haul, and that distribution up to, say, 30 miles should be by road, except for train roads to and from steelworks, generating stations and so on. In the Western Region there are some 1,500 private sidings, of which half serve the National Coal Board and the major industrial undertakings. In view of the cost of trip working and of serving these private sidings, and that of signalling and connections, it is probable that with proper integration of road and rail transport, many sidings could be closed to the advantage of all concerned.

Reference is made in the paper to the Roadrailer vehicle described in our September 9 issue. Under the Western Region plan for freight concentration there will be some 18 or 20 depots. The Roadrailer could make a very substantial contribution, Mr. Hammond believes, to the benefits which will arise from freight concentration.

The best kind of publicity is the satisfied customer. If a Gallup poll were arranged, it would be found that many of those holding an unsatisfactory opinion of the railways today have been influenced by some incident, perhaps trivial, reflecting inefficiency, inattention, or indifference in some section of the railway organisation. More, he believes, might be done to explain difficulties and to publicise the good service provided by railways. In connection with the difficulties last winter, mainly arising from shortage of key workers, Mr. Hammond had occasion to see many M.P's and members of the public, and he found invariably that if the facts were put before them, they made a sympathetic response.

In recording a further downward trend in train accidents in 1959, the Chief Inspecting Officer of Railways, Brigadier C. A. Langley, pointed out that train accidents were responsible for the death of only one passenger during the year. When this is related to the fact that 1,593 million passenger journeys took place over British Railways during the last year, it is an achievement of which railwaymen can be proud. It received little attention in the press. If the public could be told a little more, a little sooner, it would be to everyone's benefit.

The key to the railway picture of the future, Mr. Hammond is certain, depends on the willingness of management, staff and trade unions to accept the challenge to their thinking, to their enthusiasm and to their energy which the modernisation of British Railways in its widest sense involves.

The Torshear Bolt

THE Torshear high-strength friction-grip bolt is proving a remarkably effective and economical fastener for the site-connections of welded bridge girderwork on the Western Region of British Railways. Briefly, this bolt, tightened by special self-reacting hand or pneumatic tools, has an extended shank which breaks off after the tension in the bolt has reached the specified figure. Torshear is an entirely British invention and it places in the hands of the structural engineer a simple form of connector the responsibility for the tightening of which is taken out of the hands of the unskilled erector, and is placed directly under the laboratory control of the bolt makers and the Materials Inspectors. Torshear bolts are obtainable from the leading British bolt makers.

The extension of the bolt, threaded in the normal way, is separated from that threaded portion to be occupied by the nut after tensioning by a concentric machined groove. The extension breaks off through torsional failure at this groove, the diameter of which, made to an accuracy of plus or minus 0.002 in., is designed so that the bolt will, after shearing, have been loaded to within plus or minus 10 per cent of the required tension. The special wrenches, both pneumatic and manual, grip the threaded extension with a chuck and apply a counter-clockwise torque while the rotating socket fitted over the nut in the normal manner is turned clockwise. A balance of torque between the two is maintained until the increasing torsional stress on the bolt exceeds the calculated maximum torsional shear strength of the reduced area, and this portion shears, so limiting any further tightening of the nut. The air motor is then reversed, ejecting the sheared end of the bolt extension, and it is ready to repeat the cycle of operations. Specially noteworthy is the fact that the rotary movement is smooth and continuous, so that very consistent results are obtained. An incidental but important advantage, especially when many bolts have to be tightened, is that the head of the bolt does not require to be held and, therefore, in many instances manpower is halved.

It will be seen that, provided the machining of the groove and the rolling and lubrication of the threads are reasonably accurate and constant, the resultant tension in the bolt, after shearing, is independent of the skill of the operator. The tightening action of the pneumatic wrench is a continuous and deliberate motion, the final bolt-loading being wholly independent of the pressure in the air line (so long as it is sufficient to work the tool, no matter how slowly) or the capacity of the air compressor. Visual inspection of the unflawed sheared ends of the bolts is all that is needed to see whether all the bolts in a group have been properly tensioned.

Some details of the pneumatic spanner are of interest. It has a 3-h.p. reversing air motor working at 80-100 lb. per sq. in. pressure. It drives through a four-stage epicyclic gearbox with an output of 1,000 lb./ft. at only 10 rev. per min. The nose-piece is designed to take interchangeable nut-sockets for $\frac{5}{8}$-in., $\frac{3}{4}$-in., $\frac{7}{8}$-in. and 1-in. U.N.C. bolts. This remarkable machine tool, turbine-driven and with no reciprocating parts, weighs only 26 lb. The manual Torshear wrench is actuated by a ratchet lever arm and will take the whole range of Torshear bolt sizes ; it weighs only 17 lb. complete with ratchet and handle. Like Torshear in general, it is the invention of Mr. W. H. Brodey assisted by the staff of his firm, the North Bar Tool Co. Ltd., of Banbury, Oxon, of which he is a director.

It is significant that in the site-joints of the main girders of the Western Region Dan-y-Graig underbridge at Swansea, over 3,000 Torshear bolts were tightened with a pneumatic wrench without any difficulty or trouble though operated by an unskilled hand. The importance was realised of pulling up the plies really tight throughout the whole splice joints before beginning to torshear any of the bolts. This initial tightening was easily accomplished with the pneumatic Torshear wrench; the change in whine of the machine clearly indicated to the operator when he should stop short of shearing the bolts. The order in which the bolts were tightened is also of some importance, and the effect on the tension in neighbouring bolts was investigated at the Dan-y-Graig bridge as explained in an article in this issue.

Hastings Diesel-Electric Trains

EXPERIENCE gained during the past three years by British Railways, Southern Region, of operating a frequent diesel-electric multiple-unit passenger service over the heavily congested route between Charing Cross and Hastings has demonstrated the high degree of reliability coupled with low maintenance costs obtainable with electric transmission for this type of duty. Introduction of the full diesel service in 1958 enabled the previous steam-operated schedule to be accelerated by as much as 11 min. to a 90-min. timing. Passenger journeys have increased by over 40 per cent. These points are brought out in a paper, " Operating experience with diesel-electric train sets on the Hastings service of the Southern Region," by Mr. W. J. A. Sykes, Chief Mechanical & Electrical Engineer, British Railways, Southern Region, read at a meeting in London earlier this week of the Institution of Locomotive Engineers. An illustrated description of this stock was given in our May 10, 1957, issue.

Mr. Sykes prefaced his paper with a review of the circumstances which led to the introduction of the 1,000-h.p. six-car diesel-electric unit for this line. One of the bases underlying the design was the determination to use the maximum possible number of items of electrical equipment already in standard use on electric multiple-unit stock in the Region. It was found practicable to use traction motors and many components of the control and brake equipment which were interchangeable with those on the electric stock. At first sight, it might have been thought that the units were somewhat under-powered, but the paper clearly shows how the special operating conditions which restrict speeds over a considerable length of the route prevent any appreciable reduction in running time even with a 50 per cent increase in power output. The justification for the choice of 1,000-h.p. per six-car unit is thus demonstrated.

A brief reference is made to the main features of the equipment. The four-cylinder engines, one of which is mounted in a motor-coach at each end of a six-car unit, are of English Electric Type " 4 SRKT," rated at 500 h.p. at 850 r.p.m. The main generator, with its overhung auxiliary generator, is direct coupled to the engine, the complete unit being arranged for three-point flexible mounting in the engine-room. Each engine-generator set supplies two traction motors mounted on the rear bogie of each motor-coach. These motors are of the self-ventilated Type " EE507 " with a one-hr. rating of 250 h.p. Train heating is supplied from the main generators, this simple method being considered practicable because of the fixed train formation and, consequently, a constant heating load. An important feature is the installation of automatic fire-detection and fire-fighting equipment in each engine-room. The existence of unattended engine-rooms in the train remote from the driver would appear to make this a very necessary provision.

Engine troubles mainly have been confined to the fuel injection equipment which, in the early days, suffered from plunger seizure, barrel fracture, and delivery-valve breakage in the injection pumps. These defects were caused by either incorrect design or inferior material. Failures of high-pressure pipes between fuel pumps and injectors were traced to cracks associated with fine drawing marks in the pipe bore, which had escaped notice during works inspection. Only one serious engine failure has occurred ; this was due to the emulsification of the lubricating oil by water leaking into the sump from a porous cylinder head. Analysis of crankcase oil of every engine is carried out monthly, and provision is made for immediate action to be taken should the analysis show this to be necessary. Special attention is given to fuel-pipe joints as the result of earlier trouble with fuel dilution.

Although experience with these engines on oversea railways had not indicated the need for an exhaust silencer, it was found that the exhaust noise and the high-pitched whine of the turbo-charger were excessive. The subsequent fitting of a straight-through silencer successfully reduced both sounds to within acceptable limits. The electrical equipment, many components of which are of designs already proved in service on the electric stock, has been singularly free of trouble, as would be expected. The main generator at first suffered from commutation troubles; as is so often the case, it became necessary to try out different grades of brushes under service conditions to find the right brush to give satisfactory commutation and long-brush life. Glazing of the auxiliary generator commutator was cured by reducing the number of brush sets from six to four. A remedy for voltage-regulator hunting was accidentally found by connecting the negative side of the operating coil to a point between the armature and interpole coil of the auxiliary generator, but the explanation for this is still obscure.

An unusual feature described by Mr. Sykes is the inclusion of two identical batteries in each power unit, one for engine-starting purposes only, the other for coach lighting. Reliability of the engine starting system is thus unaffected by any excessive use of the coach lighting during engine shut-down periods. An unforeseen difficulty arose in connection with the train heating system because of variations in the voltage, which is determined by traction requirements on the main generator. During prolonged periods of slow running under fog conditions, the consequent low voltage of the main generator prevented an adequate supply being given to the heating system. Modifications made to the control system enabled the engine-generator set to run at an intermediate speed with the master controller in the " off " position without the necessity of operating a special switch with the master key. This speed was sufficient to allow the main generator to meet the heating load demand. The heating load makes very little difference to the train performance.

The only serious trouble experienced with the mechanical parts has been the cracking of some of the trailer-bogie side frames. It appeared that several factors had combined to produce this defect, namely, unsatisfactory finish of a cut-away portion, loose rivets, and abnormal stresses set up by a restriction on the movement of the side spring hangers caused by the spring-hanger cushioning rubbers. Modifications, which have cured the trouble, consisted of the fitting of redesigned spring-hanger gussets riveted hydraulically, welding additional strengthening webs to the side frames, and using rocking washers between the cushioning rubbers and the gusset plates. Mr. Sykes emphasises the desirability of keeping engineering maintenance and carriage-cleaning entirely apart ; at the new depot at St. Leonards the latter process is carried out in an adjacent cleaning shed. Much attention has been paid to the problem of reducing the amount of maintenance necessary as a result of which it has been found possible to dispense with the weekly examination. The paper includes schedules of the work carried out under the present system of daily, monthly, three-

monthly, and six-monthly intervals. The mounting of the power unit in the motor-coach, with consequent ease of access to the various components, enables most of the maintenance to be readily carried out in the coach itself. It is encouraging to learn how little maintenance the traction equipment has required, such items as valves, injectors, and cylinder-head gaskets being practically trouble-free. The resulting absence of dismantling rendered it necessary to make a special examination of the interior condition of some of the engines to establish an overhaul period; at present an intermediate overhaul period of 7,500 hr. is in force.

Heavy maintenance is carried out at the main works at Eastleigh, to which the engine-generator sets are transported on wagons specially designed for the purpose. At their first 7,500-hr. overhaul some wear was found to have taken place on the valve guides and piston scraper rings, and some pistons of earlier design had suffered from cracks in the top. Also, there had been some loosening of turbo-charger blades. Apart from these points, the engines were in general, found to be in excellent condition.

Locomotive Developments for the 25-kV. System

THE technical discussions and visits to electrification installations and manufacturers' works occasioned by the recent British Railways Electrification Conference have shown that while, in the main, the new designs of equipment are dictated by the need to meet the special conditions imposed by 25-kV. a.c. electrification, a number of them derive from continuing improvements and developments in d.c. traction practice.

Taking the locomotives as the first subject for study, the use of the Bo-Bo wheel arrangement for speeds up to 100 m.p.h. is noteworthy. Hitherto, experience has been limited to three-axle bogies for speeds up to 90 m.p.h. The manufacturers were free to develop their own individual designs to meet the specified requirements, and all of them demonstrate the increasingly important part played by rubber elements in bogie design. In particular, the employment of rubber cone pivots, taking the main weight of the body, indicates the degree of reliance now placed on the application of this material.

With regard to the bodywork, the manufacturers were again at liberty to devise their own methods of construction, which, in some cases, are based on recent diesel-electric locomotive practice. These include, for purposes of weight reduction, the introduction, on a considerable scale, of light-weight materials, such as resin-bonded glass fibre and aluminium alloys for certain parts of the bodies. An interesting development in body design is exemplified in the British Railways-built locomotives, in which the underframe and the lower halves of the body sides are combined to form a trough-section steel structure which carries all loads. The upper portion of the body, including the roof, is of light construction and may be removed in its entirety to give exceptional access for maintenance and facility for replacement of equipment.

One of the most interesting features of the electrical equipment is the pantograph. The original design of this type of pantograph was used on the locomotives of the French National Railways 25-kV. system, and its subsequent performance in service largely influenced the decision to adopt a modified version as standard for both locomotives and multiple-unit stock on British Railways. The choice was also governed by the prevalence of certain severe conditions, such as the rapid variation of wire-height between the extreme limits at overbridges and level crossings, and the limitations of space on the rolling stock imposed by the restricted loading gauge, the large wheel diameter, and the necessary electrical clearances through structures.

All locomotives are fitted with a roof-mounted standard air-blast circuit breaker of continental design, this being the only fully-developed type available at the time which was considered suitable. Its duties in service are more than usually onerous as it is required to operate at every neutral section. The largest single item of equipment is the main transformer, the various designs of which fall into two categories, namely, those employing tap changing on the h.t. side and those with tappings on the secondary winding. It will be of interest to learn in due course which of these two systems proves to be the more satisfactory.

At first, all four makes of contractor-built locomotives were designed to incorporate mercury-arc rectifiers of various types but the semi-conductor type of rectifier had reached a stage of development which, it was considered, justified its inclusion in the later series of locomotives which have British Railways-built mechanical parts. It will thus be possible to make an early comparison of the performance in service of the two fundamentally different types of rectifiers. The reduced weight and bulk of the semi-conductor rectifiers has, incidentally, allowed the latter locomotives to be fitted with rheostatic brake equipment.

A notable feature is the adoption throughout the whole series of locomotives of frame-mounted traction motors, associated with two Continental designs of flexible drive. It is pertinent to recall the policy followed in the main-line diesel-electric programme from its inception wherein the conventional axle-hung type of motor is used on locomotives having axle-loads and maximum speeds comparable with those of the electric locomotives. The opportunity is now presented of making a reliable comparison of the behaviour and performance of the two types of motor, and particularly their effect on the track. It is clearly desirable to have an early answer to the question whether the considerably greater cost and complication of the frame-mounted motor and its flexible drive will be justified in future applications.

One of the most interesting of the new developments associated with the control system is the equipment devised to overcome the difficulties arising from the incidence of neutral sections in the overhead line. On the approach to a neutral section this equipment is brought into action by a relay mounted on the bogie as it passes through the field of a permanent magnet inductor suitably positioned beside the track. The effect is to open the air-blast circuit breaker before the dead section is reached, thereby preventing damage to the pantograph and overhead wire by arcing. By means of a voltage detection device, the power equipment of the locomotive is adjusted to operate on the voltage of the supply at the further end of the neutral section before the circuit breaker can re-close. The whole sequence of operation is automatic, of practical advantage so far as locomotive operation is concerned, and essential in the case of multiple-unit stock. Another feature of the control system is the arrangement of the master controller which is standard on all the a.c. locomotives and is also used on the new Southern Region d.c. locomotives.

The freedom of choice afforded to the manufacturers resulted in a variety of arrangements for supplying the auxiliary machines and other auxiliary equipment. These include single-phase motors, three-phase motors supplied by a converter set, as well as d.c. machines fed from rectifiers or from motor-generator sets. In general, the fans, blowers, and pumps are driven by a.c. machines, while exhausters and compressors have d.c. motors.

Letters to the Editor

(*The Editor is not responsible for opinions of correspondents*)

Southern Region Electric Stock

October 12

SIR,—In his very full reply published in your September 9 issue, Mr. F. D. Y. Faulkner has omitted one important point. He states that the Gresley bogie is unacceptable to the Southern Region as it requires a lateral displacement at least twice that which that Region can tolerate.

If this is so, can he say why the Southern Region accepts steam stock of the former London & North Eastern Railway using these bogies freely over its system, or why the same problem does not seem to have been encountered on the British Railways standard steam stock operating in the Southern Region ? The latter stock uses a double-bolster bogie with a very similar displacement characteristic to the Gresley bogie, though it seldom rides as well except when newly overhauled.

Yours faithfully,

A. DELLOW

4, Hamilton Avenue,
Hoddesdon, Herts.

THE SCRAP HEAP

Cheaper to Burn

The German Federal Railway has been burning bodies of old coaches before selling the metal parts. The high cost of labour and low prices obtainable for old timber make this course cheaper than removal by hand of the wooden fittings

English as She is Announced

At Gatwick Airport station the other day a woman listening to the usual commentary remarked: "These railwaymen do speak English badly. You can't understand a word." The announcement was in perfectly clear French.—"*Peterborough*" *in* "*The Daily Telegraph*."

Last French Water Troughs

The last sets of water troughs on the French National Railways are reported to have gone out of use recently. Both were in the Western Region: at Léry-Poses, near Pont-de-l'Arche, on the Paris-Rouen-Havre main line; and at Arnières, near Evreux, on the Paris-Cherbourg line. The former French State Railways which, until nationalisation of all French main-line railways in 1938 corresponded roughly with the present Western Region of the S.N.C.F., was the only railway in France to make use of track troughs. A correspondent has sent us the illustration of a Paris-Bordeaux express of the Chemins de fer de l'Etat of about 1908-10, taking water on the non-stop run between Chartres and Thouars, 148 miles. At that time this was the longest non-stop run in France, as the Paris-Calais expresses of the Chemin de fer du Nord stopped for water at Abbeville. This Paris-Bordeaux service competed with that of the Paris-Orleans Railway. After 1938 the S.N.C.F. re-allocated certain lines in Western France as between the Western (former State Railways) and South-Western (former P.O. and Midi Railways) Regions, and re-organised passenger services. Much of the former Paris-Bordeaux main line of the French State Railways is now a secondary line, and has been converted to single track.

Reproduced by permission of ["*The Pennsy*" *and the Pennsylvania Railroad*

"*Dig that one, Pop. It's got television!*"

London Trolleybus for Paris Museum

A 22-year-old trolleybus has been presented by London Transport Executive to the Association pour le Musée des Transports Urbains, Interurbains et Ruraux for its museum in Paris. The vehicle is No. 796, one of the 150 Class "H.1" trolleybuses with Leyland chassis and Metropolitan-Cammell-Weymann bodies built in 1938 for use in the pre-war tram conversion scheme. It was towed from Edmonton Depot to Dover by a London Transport lorry and conveyed in the British Railways car-ferry *Lord Warden*, to Boulogne, whence a vehicle of the Régie Autonome des Transports Parisiens hauled it to Paris. A Leyland trolleybus was chosen because a specimen of the London Transport type, with A.E.C. chassis, is already included in the B.T.C. Clapham Museum.

Photo] [*F. Merton Atkins*

French State Railways express of 1908-10 *picking up water on non-stop run between Chartres and Thouars. Note chaired track*

Slips and Slipping

Disappearance of the last slip coach working from British Railways, Western Region, timetables, reminds a correspondent of a London & North Eastern Railway working notice of about 1928. This read: "Slip No. 23 to Working Timetable. Owing to bank slip at Mile 34, Train No. 43 will pass through slip road No. 45 to Platform 3 and STOP instead of slipping."

Self-help Barrows

The luggage barrows at passengers' disposal at Leeds Central and at other stations in the North Eastern Region, British Railways, are referred to in the *Yorkshire Evening News* as under :—

"If you have only one piece of luggage with you it probably doesn't matter. If you have two or three bags and there isn't a porter in sight, these barrows are just the job.

"Oh, Mr. Porter, don't think I'm crabbing you.
I'd sooner let you have your tip than push this how'd-you-do ;
But I'm really so short-winded—these bags are not so light.
I waved my hand at you in vain, and hence this comic sight."

OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

VICTORIA

Melbourne Underground Railway

Preliminary planning and site investigation for the proposed £30,000,000 Melbourne underground railway will begin this year. Loan allocations this financial year for railway works, announced recently by Sir Arthur Warner, the Minister for Transport, include £25,000 for the work. The total amount allocated for all works is £7,550,000. Work on the underground railway will be speeded up in 1961 as engineering staff are released from the Melbourne-Albury standard-gauge project.

NEW ZEALAND

Rotorua Rail-and-Road Terminal

The combined rail-and-road terminal at Rotorua, due to be opened by the Minister of Railways, Mr. Michael Moohan, on November 15, will be the first of its kind in New Zealand. The new building is 284 ft. long by 28 ft. wide, served by a 260-ft. railway platform on one side, and sheltered loading or unloading space for up to 10 buses on the other side. An 89-ft. long first-floor section accommodates administrative offices and communications staff.

Developments at Bluff Harbour

The first train to cross the Southland Harbour Board's 590-ft. rail-and-road Bluff Harbour access bridge, from the mainland to the new 84-acre artificial island harbour, conveyed a load of ballast for the new marshalling yard on the island. The Bluff Harbour development scheme includes all-weather mechanical meat-loading facilities.

Construction of the yard on the island, and of the rail link to the mainland is being undertaken by the Railways Department. More than seven miles of track are being laid in the yard. Two 120-ft. flood-light towers will illuminate the area at night. A wagon repair depot, office, and staff amenities block are to be erected. On the mainland, near the bridge approach, a signalbox named Bluff Junction is to be erected.

Diesel Working of Goods Trains

Express goods trains between Murupara and Kawerau are now hauled by three "Dg" class diesel-electric locomotives operating in multiple-unit, a total of 2,250 rated h.p. The fast logging trains, operating at a maximum speed of 40 m.p.h., may now be made up to 29 "UL" class bogie log wagons and brake van. With 26 tons of pine logs on each wagon, each train weighs about 1,150 tons. A new timetable provides for four round trips a day over the 36-mile line between 3.45 a.m. and 10 p.m., empty on the outward journey and loaded on the return, with 1½ hr. allowed for the run from Murupara to Kawerau. This service enables 3,000 tons of logs a day to be brought to the pulp and paper mill at Kawerau. Previously, with two locomotives in use and the load restricted to 22 wagons and van, five or six round trips daily were necessary.

RHODESIA

Pay Dispute

A meeting of the Joint Industrial Committee for African employees of the Rhodesia Railways was held at Railway Headquarters in Bulawayo on October 10 to discuss claims put forward by the Railway African Workers' Union. The General Manager, Mr. J. W. S. Pegrum, presided. The principal claim was for wage increases for all employees in Groups 1 to 11, totalling some 21,000 men; increases were sought of £3 to £3 15s. a month according to length of service. These further claims follow increases agreed by the Joint Industrial Committee in July, when wages in Groups 1 to 11 were raised by £1 1s. 6d. a month, family allowances increased, and some 2,000 employees up-graded. No agreement was reached last week, and the management and the union have reported a dispute to the Minister of Labour and requested that the claim be considered by a Special Industrial Council.

Class "7800" Bo-Bo-Bo locomotive at Santa Cruz de Mudela, Spanish National Railways, at the end of the newly-electrified section

CANADA

C.N.R. Branch Opened in N. Manitoba

The 52-mile line of the Canadian National Railways between Optic Lake and Chisel Lake, in Northern Manitoba, was opened recently. The last spike was driven by the Consulting Engineer, Mr. J. L. Charles, and the opening ceremony also included loading of the first wagon of ore for despatch to the Hudson Bay Mining & Smelting Company smelting plant at Flin Flon. Movement of this traffic is the purpose of the new line.

Fewer Goods and Passenger Vehicles

At the end of last year goods vehicles owned or leased by railways in Canada totalled 194,512, or 2,381 less than a year earlier. An additional 4,853 privately-owned vehicles brought the total number in goods service in 1959 to 199,365.

Increase in Route Mileage

The route mileage of all railways in the Dominion amounted to 59,394 at the close of 1959, 75 miles more than a year previously. Of the 1959 total 44,209 miles (44,125 in 1958) were first main-line track; 2,305 (2,444) miles were second main-line track; 1,219 (1,216) miles industrial track; and 11,616 (11,534). miles were yard tracks and sidings.

Abolition of Steam Haulage

Conversion from steam to diesel motive power progressed rapidly during 1959, and by the end of 1960 the steam locomotive is expected to have disappeared from Canadian railways, with very few exceptions. In 1959, 446 coal- and oil-burning engines were withdrawn from service, leaving only 1,541 steam locomotives in operation. Diesel units increased to 3,155 from 2,799, and electric locomotives were reduced in number by 51, compared with 64 in the previous year.

SPAIN

Extension of Electrification

Electric operation through the Despeñaperros Pass on the main line between Madrid and Andalusia has been extended southward to Cordoba and northward to Alcazar de San Juan, providing an electrified section on this

line with a total mileage of 183. The diesel locomotives hitherto used have been transferred to the southern sections of main lines in Andalusia; with electrification this has made possible accelerations of more than one hour between Madrid, Seville, and Malaga, and of over 2 hours between Madrid and Algeciras.

PORTUGAL

Second Class Accommodation Withdrawn

Second class has been abolished in express services between Lisbon and Oporto, and on certain other routes. Except for some local trains in the north of the country, almost all trains in Portugal now provide only two classes, first and third.

WESTERN GERMANY

Lightweight Rail Grinder

The German Federal Railway, which has for many years been using a rail grinding train to eliminate undulatory wear, has brought into use a petrol-driven lightweight mobile device for use at points and on secondary lines. The machine, which operates on one rail at a time, can be worked by two men who can lift it clear of the track when necessary.

Railway Tourist Bus Services

The Federal Railway bus service for tourists along the scenic highway between Würzburg, in Northern Bavaria, and Füssen, in the Bavarian Alps, has been extended into the autumn.

ARGENTINA

Reorganisation of Railway System

After the signing of a contract between the Argentine Government and a number of North American and European firms, with the intervention of the World Bank, as reported in our issues of June 17 and July 1, a supplementary agreement was signed in Washington on September 30 by Mr. J. Burke Knapp, Vice President of the World Bank, and Eng. Alberto R. Costantini, Minister of Public Works of the Argentine Government.

The World Bank has designated Lt.-General Thomas B. Larkin as Technical Director with complete supervision over the plan, one of the most important and comprehensive ever undertaken, for the reorganisation of Argentina's railway, road, and river transport system. The Special Fund of the United Nations is contributing $475,000, and, as previously stated, the Argentine Government has earmarked 100 million pesos for the studies. The committee will be composed of foreign and Argentine experts in equal proportions. General Larkin, who was in charge of supplies to North Africa during the 1939-45 war, will shortly take up his functions in Buenos Aires.

Suspension of Train Service

The General Roca Railway has suspended the train services over the Ing. Jacobacci to Esquel narrow-gauge branch because of trouble with the locomotive men of the El Maitén depot.

Publications Received

The Beauty of Railways. With an introductory essay by C. Hamilton Ellis. London: Max Parrish & Co. Ltd., 55, Queen Anne Street, W.1. 10¾ in. x 8½ in. 128 plates, 21 pp. text. Price 35s.—The 162 illustrations, mostly photographs, some of the latter taken by well-known amateurs and many supplied from official sources, including the British Transport Commission, depict a wide variety of railway subjects, largely in Britain, on the Continent of Europe, and in North America. Among the artists whose paintings or watercolours are reproduced is Mr. Terence Cuneo. The standard of reproduction and presentation is high. The emphasis is on the aesthetic, but notes on the subjects would have added to the pleasure of most readers.

The Vital Link.—This 21-page illustrated brochure, published by the Morgan Crucible Co. Ltd. of Battersea Church Road, London, S.W.11, for the recent British Railways Electrification Conference, describes the part played by the company's products in the development of electric railway traction over the past 50 years. A difficulty experienced on the world's first electric tube railway, the City & South London, opened in 1890, was that of developing a sunbaked motor brush material. Copper and gauze were widely used at that time, but were generally unsuitable because of the high rate of wear of the commutator. In the U.S.A. the same problem had been encountered in 1888, when the Thomson Houston Company had begun trials with carbon brushes, and the results led to adoption of the carbon brush. Morgans, as manufacturers of crucibles, was experienced in the use of carbon and graphite. In 1903, after much research and experiment, the firm began to supply carbon brushes to the electrical industry. The progress since then and the applications of carbon to railway tracks today, including pantographs, are described clearly and succinctly. In the section entitled "The Morgan Crucible Company Today" are enumerated the items of traction equipment manufactured by the company. A final section indicates the main features of the British Railways electrification programme, to implementation of which Morgans is making a large contribution. The text is illustrated with sketches and drawings.

Into Europe: Your Opportunities in the Common Market.—This booklet, published by Production Engineering Limited, is a brief survey of the expanding European market. It includes tables showing comparative economic trends in the United States, the Common Market, and the United Kingdom during the past decade. A survey is given of the consulting services of Production Engineering Limited, and of the new company, Production-Engineering Société Anonyme, with headquarters in Paris. Further information is obtainable from Production Engineering Limited, 12 Grosvenor Place, London, S.W.1.

Examples of Structural Steel Design.—By Lewis E. Kent, M.I.C.E., M.I.Struct.E., M.Cons.E., and E. G. Lovejoy, A.M.I.C.E., A.M.I.Struct.E. London: British Constructional Steelwork Association, 94-98, Petty France, S.W.1. 11 in. x 8½ in. Paper covers. 66 pp. Fully illustrated with diagrams. Price 3s. 6d.—This B.C.S.A. Publication No. 13/1960, is a revised edition of B.C.S.A. brochures Nos. 1, 2, and 4, originally published in 1950 and 1951. The text has been completely rewritten to accord with the requirements of B.S.449/1959, "The Use of Structural Steel in Building." The complete analysis and design is given for two single-storey sheds with pitched truss roofs of 50 ft. span. A single-bay structure and a three-bay structure are dealt with in detail and all elements of the structure are included, from purlins to holding-down bolts, attention being drawn to the appropriate clauses in B.S. 449.

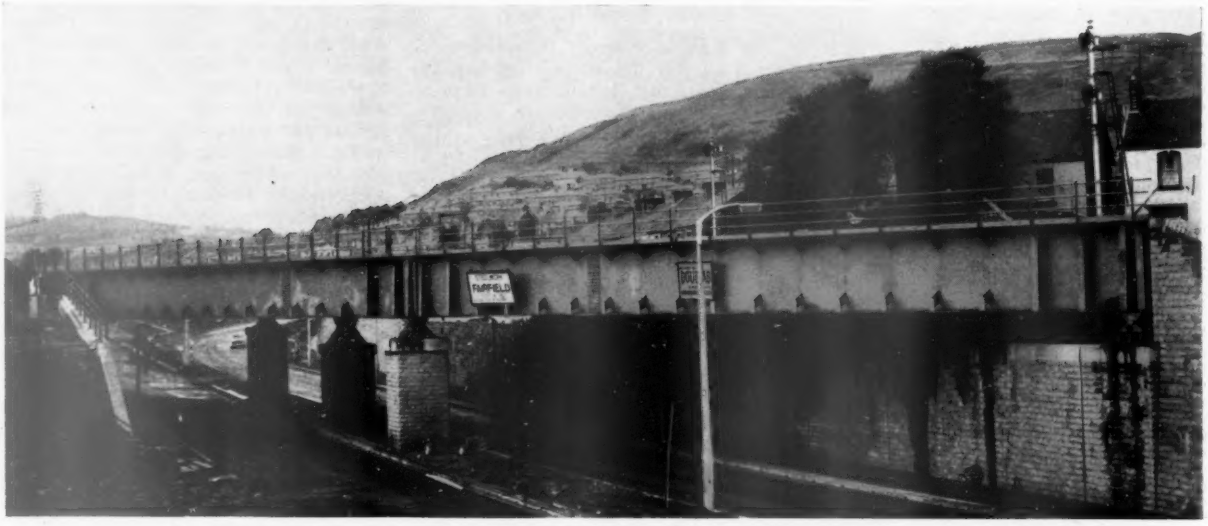
Craven Machine Tools.—The September-October issue of the *Craven Machine Tool Gazette* gives details of a 86/164-in. centres sliding, surfacing, and screw-cutting lathe of separate construction: some refinements and optional features in the 10-ft. vertical boring and turning mill; a 16-in. centres double-headed wobbler end milling machine; and solid disc wheel turning mills installed at Durgapur steelworks, in India. Copies are obtainable from Craven Bros. (Manchester) Ltd., Vauxhall Works, Reddish, Stockport.

British Gear Manufacturers' Association Buyers' Guide.—The first edition of the "Buyers' Guide," published by the British Gear Manufacturers' Association, of 301, Glossop Road, Sheffield, 10, has been revised and re-printed. It is designed to help buyers at home and overseas by making known the range of products and services available from British manufacturers. The first part lists firms which are members of the Association. The second is a general index giving the principal types of gear, and under each, the names of makers; the classification is general, and for special types of gear, and so on, reference must be made to the entries in the third part. The latter is a complete list of the range of products.

Winter Sports.—The 1960-61 winter sports holiday programme of Thos. Cook & Son Ltd., and Dean & Dawson, includes a wide range of resorts in Austria, France, Germany, Italy, Jugoslavia (the Julian Alps), Norway, Scotland (Carrbridge, Nethybridge, and Grantown-on-Spey, Spain (the Pyrenees) and Switzerland.

All-Welded Bridge at Dan-y-Graig, Western Region

Largest all-welded railway plate-girders field-jointed entirely with Torshear bolts



General view of Dan-y-Graig underbridge, Western Region, almost completed

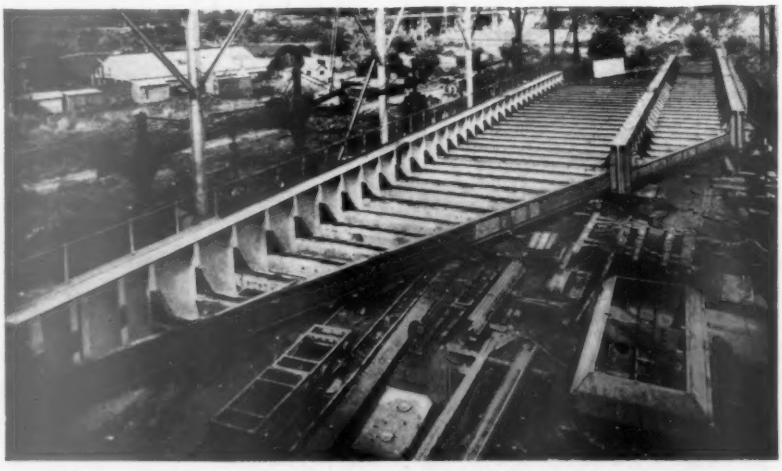
ONE of the largest individual works involved in the Swansea East Side Road improvement scheme is the replacement of the Dan-y-Graig masonry arch by a 200-ft.-long girder bridge.

The new bridge, embodying 400 tons of mild steel including cross girders, has several interesting features. The main girders, continuous over the two equal-length spans, are believed to be the largest plate girders so far used in any all-welded railway bridge.

Use of Bolts at Joints

In accordance with the usual British Railways, Western Region practice all the site-joints have been made with high-strength (H.S.) friction-grip bolts, but this is the first time that Torshear bolts have been used in the two all-important flange-and-web splice-joints in each of the three main girders. Moreover the knuckle and sliding bearings under the main girders are of spheroidal graphite cast-iron with forged steel knuckle pins, and bronze slipper plates.

There are three ballasted tracks over the bridge, two on one side and one on the other side of the central main girder. They are carried on a deck of pre-cast reinforced concrete jack-arches supported on concrete skewbacks cast on the bottom flanges of the welded cross girders. The cross girders are connected to stiffeners on the main girders with shear plates, the joints being completed with H.S. bolts. The three continuous main girders weigh 67, 128 and 53 tons respectively. Because of the acute angle of skew, one end of the outer girders has a lead of 118 ft. over the other outer girder. To give freedom of movement under changes of temperature, all six bearings under the outer girders are designed to slide in the lateral as well as the longitudinal direction. Under the central girder the middle bearing is fixed and constrained in all directions, but the bearings over the abutments though restrained from lateral movement are free to move longitudinally.



Superstructure assembled in all-welded sections, field bolted together

Torshear Bolts

The whole of the welding was done in the contractor's workshops, all field connections being completed with H.S. bolts. The field splices in the webs and flanges of the main girders were made with $\frac{7}{8}$-in. dia. Torshear bolts, the numbers of these bolts in the total of six joints in the three girders being 792, 1,272 and 664 respectively. In almost all cases the number of plies in these joints was three, and the length of the bolts varied between $2\frac{7}{8}$ in. and $9\frac{1}{4}$ in. The bolts were tightened and torsheared to give a tension of between 16·3 and 19·0 tons, the average load per bolt being 17·3 tons. During the erection of the main girders, the sections complete with splice-plates lightly attached and slung from cranes, were edged against one another and temporarily secured by a few Torshear bolts lightly tightened. A number of parallel-shank close-fitting drifts were used to align the parts, and it was not until after the camber had been checked that the joints were completed and the Torshear bolts sheared off. The coefficient of limiting friction between the unpainted as-rolled surfaces of the plies was taken as 0·45, giving an average double shear value of 10·38 tons for each bolt, allowing a factor of safety of 1·5. This compares with the normal working value in double shear of 8·98 tons for a $\frac{7}{8}$-in. dia. mild-steel rivet filling a $\frac{15}{16}$-in.

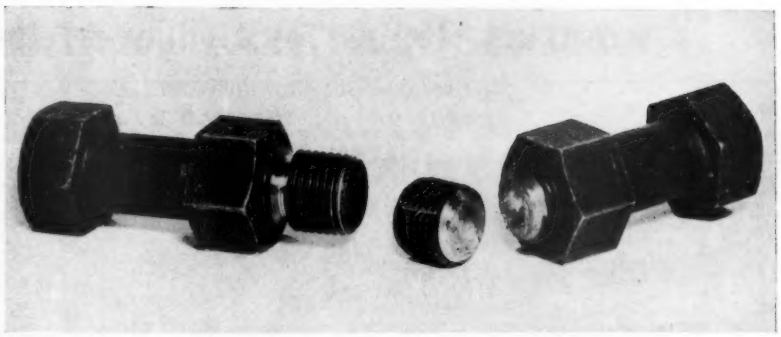
dia. hole. Whereas a $\frac{7}{8}$-in. H.S. bolt gives an average load of 17·3, that of the rivet is only 10·85 tons, the ratio of bolt tension to rivet tension being 1·59.

The Torshear bolt, its operation and results are briefly outlined in an editorial in this issue. On one of the joints of the bridge, tests were made to check the effect on the tension in neighbouring bolts : (*a*) with all the bolts pre-tightened, and (*b*) without pre-tightening. The results, shown in the accompanying diagram, showed how essential it is to bed down fully all plies before completing the tightening of all the bolts, be they ordinary H.S. or Torshear bolts.

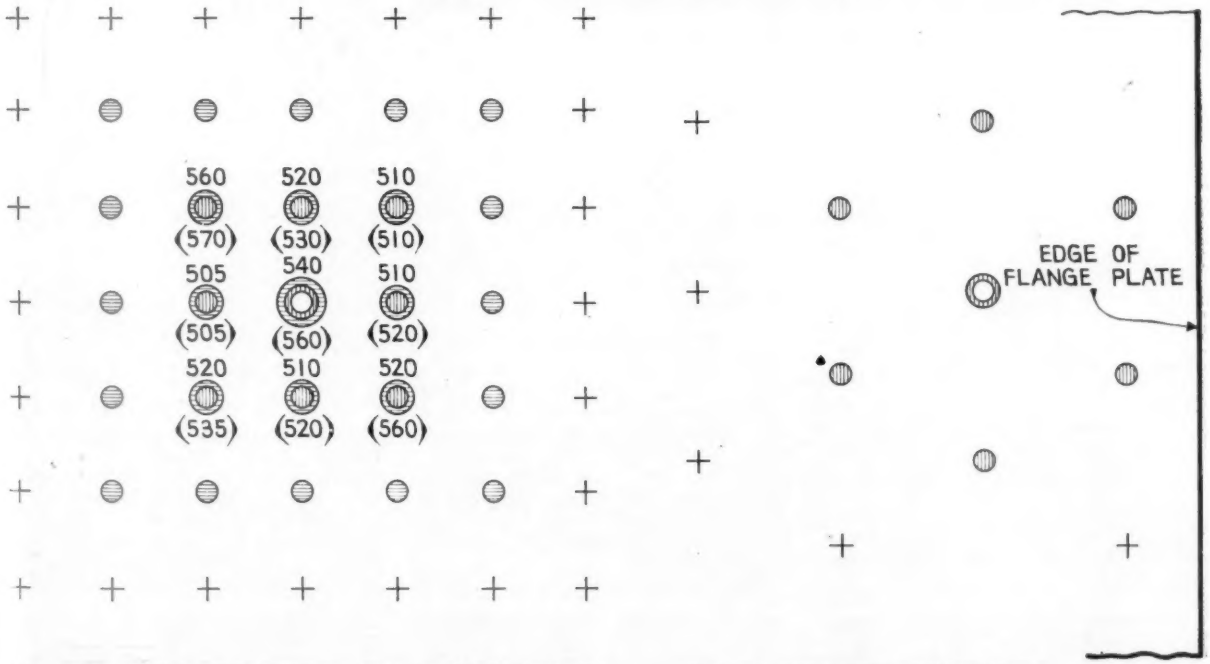
Tests for Slip in Flange Joints

To ascertain whether there was any tendency for slip to occur in the flange joints under load, tests were made under the very first live load allowed on the bridge. Under this test load of two coupled 2-8-2 tank engines, Huggenberger tensometers fixed over the gap between the butting ends of the flange plates showed a return to the same initial reading after the passage of the engines, thus confirming that no slip had taken place.

The girderwork was fabricated by the Fairfield Shipbuilding & Engineering Co. Ltd., who also cast the concrete skewbacks on the cross girders and erected the whole of the superstructure. The precast jack-arch units were made by the main contractors for the bridge, Robert M. Douglas (Contractors) Limited. who were solely responsible for the substructure work. The spheroidal graphite cast-iron bearings were supplied from the Machynys Foundry & Engineering Works of Richard Thomas & Baldwins Limited, Llanelly, and the bronze slipper-plates by the Manganese Bronze & Brass Co. Ltd., Ipswich. The general application of the Torshear principle and the design of the special pneumatic and hand wrenches are the invention of the North Bar Tool Co. Ltd., of Banbury, the makers of the wrenches. The bridge was designed in the Steelwork Office of the Civil Engineering Department at Paddington, under the general direction of Mr. M. G. R. Smith, Chief Civil Engineer.



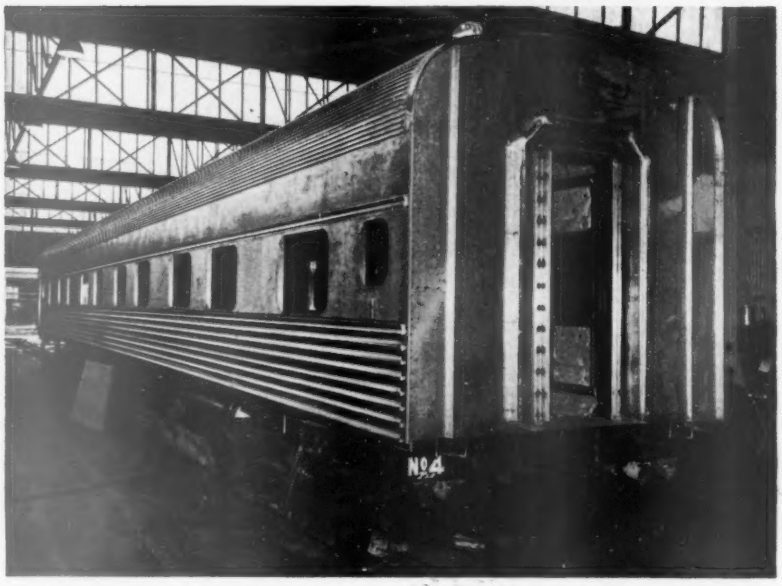
Torshear bolts (left): before tightening, and (right): after tensioning to the extent of shearing at the groove



Bolt torques before and after tightening adjacent bolts in flange splice

Luxury Trains for Sydney-Melbourne Service

Australian-built stainless-steel coaches for overnight operation on through standard-gauge line



Stainless-steel coach under construction for the Sydney–Brisbane service. The standard-gauge Sydney–Melbourne coaches are similar in appearance

A CONTRACT valued at some £A2,000,000 was awarded recently to Commonwealth Engineering Co. Ltd. of Granville, Sydney for the construction of two luxury air-conditioned stainless-steel train sets for overnight operation on the Melbourne-Sydney standard-gauge line. The order, with spare coaches, totals 34 vehicles. Each will comprise roomette (single berth) and twinette sleeping cars; a dining car; a club car, with continuous refreshment service; a car with luxury sleeping compartments for either individual occupancy or group travel; a brake van; and mail and parcels van with diesel-powered generating equipment to provide power for heating, lighting, cooking, and air-conditioning. Each bed in the sleeping compartments will have a foam - rubber mattress and individual reading light. The ready-made-up berths, when folded, will provide seating for daytime travel.

Each sleeping compartment will have a wash basin, toilet, full length mirror, wardrobe, and other refinements. Iced water will be on tap and venetian blinds fitted to each doubled-glazed window. The double berth twinette cabins will each have their own hot and cold showers. Travellers in the single berth roomette cars will use shower rooms at one end of the coach.

Twinette Sleeping Car

Each train will include one de-luxe twinette coach equipped with a bed-sitting room, complete with arm chairs and at one end two family units each comprising two twinette cabins linked by a connecting door. The dining car, with stainless-steel kitchen equipment and all-electric cooking, will service 48 passengers in one sitting, with three-course meals, or light refreshments.

The club car, in which light refreshments will also be served, will be divided into three sections by armour-plate glass. Its lounge will seat 40 passengers. There will be a writing table and small portable tables for serving light refreshments. Other features of this car are refrigerated cabinets for storage of drinks and making ice cubes, water and coffee urns, cupboards, service table, stainless-steel sinks and drainers, shelves and racks, and power points for toasters and hot plates.

Stainless Steel Structure

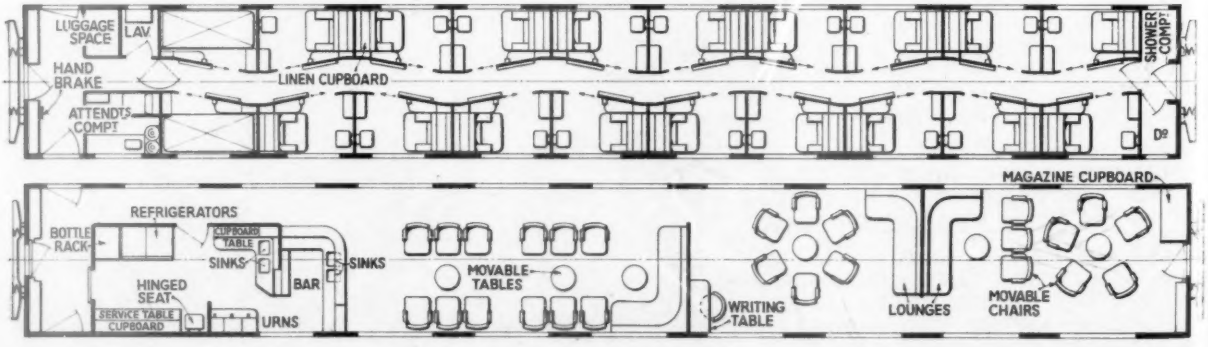
Shot-welding, based on the technique developed by the Budd Manufacturing Company, U.S.A., will be used by the Commonwealth Engineering Co. Ltd., which is the only Australian licensee for the process of welding stainless steel. The coach structures will be fabricated by welding, and sheathed in the first Australian-rolled stainless steel manufactured for railway coach construction, at the new Unanderra, New South Wales, plant of Commonwealth Steel Co. Ltd.

One hundred and eighty-seven tons of stainless-steel sheet will be required. It will be delivered to the builders in coils and the strips will be fluted for strength and rigidity, giving the unpainted exterior of the coaches a clean and attractive finish.

A 2-in. thick lining of glass-fibre insulation will reduce noise and at the same time help maintain the comforable temperatures provided by the air-conditioning plant.

Each sleeping car will weigh 42 tons and carry 340 gal. of water in underframe slung tanks. Both the roomette and twinette coaches will each carry 20 passengers and the de-luxe twinette cars 18; a total complement of 198 passengers per train.

All coaches will be mounted on Australian-made cast-steel four-wheel roller bearing bogies, designed to provide smooth riding at speeds up to a maximum of 80 m.p.h. One train will operate in each direction nightly to a schedule of approximately 13½ hr. for the 590 miles journey. The trains will be hauled by 1,800-h.p. diesel-electric locomotives.



Layout of roomette sleeping coach (above), showing end compartments made up for night travel, and club car (below)

ELECTRIC RAILWAY TRACTION SECTION

Transductor Control Schemes

IT was encouraging to learn from the British Railways Electrification Conference that not only are solutions being found to problems peculiar to the 50-cycle system, and in particular to its application in this country, but also that designers do not feel themselves tied to practices hitherto common to a.c. traction irrespective of frequency. With so much to do in other directions, it would have been easy to accept, where possible, methods which have become established elsewhere. Instead of this, all questions have been approached with an open-mindedness which has been a powerful stimulus to development.

One direction in which this attitude is seen is in control gear. A variety of methods has been used to obtain a large number of voltage steps with economy in the number of transformer tappings. In some schemes the same tappings are used twice during acceleration, first with only the tapped portion of the transformer secondary in circuit, and then with additional untapped turns connected in series with it. Another method uses resistances to provide additional voltage steps between those available with the normal arrangement of centre-tapped transition reactor. These and similar systems reduce the current peaks on notching and increase the tractive effort which may be developed without slipping. They also lighten the duty of the contactors used for tap-changing.

Such developments have as their logical end the goal of stepless acceleration. This objective has been in view throughout the progress of British a.c. traction technique. It was referred to in 1957 in the paper on " Electrical Equipment for Rectifier Locomotives," read to the Institution of Electrical Engineers by Messrs. H. B. Calverley, E. A. K. Jarvis and E. Williams, of the English Electric Co. Ltd. At that time the authors envisaged the use of induction regulators or regulating transformers for this purpose. They referred to the use of continuously-variable transformers in two Swiss Federal Railways motor coaches built in 1939, the arrangement in this case being a contact that rolled over the periphery of the secondary winding.

At the same time the authors observed that it was desirable to reduce the rating and size of induction regulators or regulating transformers by using them to span the voltage tappings on the main transformer rather than to provide the whole range of voltage control themselves. As is now known, a motor coach equipped by the English Electric Co. Ltd. with a Brentford continuously-variable auto-transformer used in the former way has been running in regular service on British Railways since June this year.

It is indicative of the pace and variety of technical progress that whereas this paper of 1957 did not mention the possibility of transductor control, a scheme of this kind has been developed and was shown diagrammatically on the stand of the English Electric Co. Ltd. at the British Railways Electrification Exhibition. In this arrangement, too, the transductors provide smooth increase of voltage between tappings. To effect the full range of control from zero to maximum volts by means of transductors alone would require equipment of prohibitive size and unacceptable power factor. The present scheme, therefore, varies the impedance of the transductors over a relatively small range by changing the d.c. current through their control windings, these changes being made automatically by equipment in the controller as the handle is moved from notch to notch.

Another application of the transductor to traction control has been made experimentally by the Swiss Federal Railways in a motor luggage van. Its function here is to generate control pulses which govern the rate of notching under the influence of a reference signal applied to one control winding of the transductor from the driver's controller, and of another signal in a further control winding proportional to the traction motor current.

The controller itself is marked with "notch back" and two " notch up " positions. One of the latter provides a slow rate of notching for shunting movements, while the other gives the maximum rate and automatically adjusts the notching current according to the actual acceleration attained. Movement of the controller to a further position enables notching up or notching back to be arrested at any time. The rate of notching back does not depend on vehicle speed but is set at two notches per second. Similar facilities are provided in this motor luggage van for the control of braking effort during regeneration.

In this installation the transductor output pulses are applied to ordinary relays, but it is not looking far ahead to foresee similar schemes in which the switching elements might be controlled semi-conductor rectifiers or similar devices capable of being switched rapidly and with little power between their conducting and non-conducting conditions. The further development of static control apparatus such as this has become of particular interest in consequence of the present increased requirement for rotating auxilary machinery in 50-cycle motive power.

Motors for A.C. Traction

ALTHOUGH no fundamental changes have been made in its design, the rectifier-fed traction motor is distinguished in various constructional and dimensional details from its straight d.c. counterpart. One designer, for example, has described recently how his machines have become shorter but of greater diameter in the interests of good commutation, at the expense of some increase in weight. Despite this, a recent survey of modern traction motors in *Deutsche Eisenbahn Technik* showed that machines for rectifier systems are of approximately the same weight per kilowatt as those for a 16 2/3 cycle a.c. supply.

Both these machines were shown to be lighter than comparable d.c. motors for 1,500 V. The best that is usually claimed for the 50-cycle a.c. traction motor is that it has now been brought down to dimensions and weights similar to those of low-frequency machines, and in this country at the moment it is felt that there is little likelihood of a return to this type of motor for 50-cycle traction.

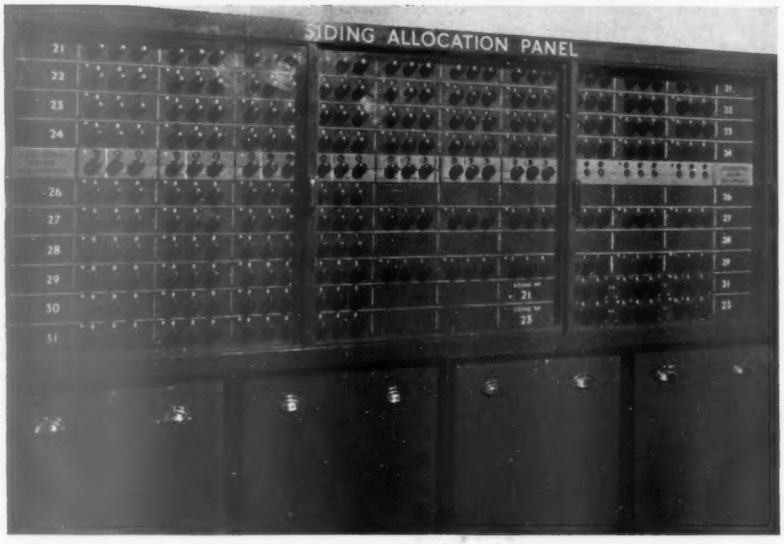
The progress that has been made with it is acknowledged, but there is some disposition to regard the effort expended as having been devoted to trying to make something work which fundamentally ought not to work. Where development in this direction is continuing, however, it has been found that higher outputs for a given diameter of armature can be taken from tandem motors, having two short armatures connected in series, than from machines with armatures of conventional form by carrying special two-layer windings. Figures quoted are 480 kW. from a tandem motor with an armature diameter of 23½ in. as against 400 kW. from a single armature motor of similar size ; and 660 kW. against 550 kW. in the two cases when the armature diameter is increased to 31½ in. The physical characteristics of the a.c. series motor are governed by the admissible value of transformer e.m.f., and if the currents due to this effect can be minimised an increase can be made in motor voltage.

Good results are stated to have been achieved with three-part brushes, which have worn at the rate of only some 0.007 per kilometre and have shown better commutation in overload conditions than monobloc brushes. It has been difficult to obtain conclusive results with motors having resistive connections to the armature winding. A system with encouraging possibilities is the application of split brushes with their two sections insulated from each other, but connected through a centre-tapped inductance.

A further winding on the same core is traversed by the armature current and induces in the first a voltage opposing the transformer e.m.f. Here again the practical factor of weight tends to outweigh the theoretical advantage. The conclusion is left that the adoption of rectifier systems is far from defeatist, for work on the 50-cycle machine still appears to be concentrated on overcoming its fundamental drawbacks rather than developing it in new forms.

Programme Machines for L.T.E. District Line

Automatic control of signalling at Parsons Green and Putney Bridge with remote supervision from Earls Court



Siding allocation panel at Parsons Green

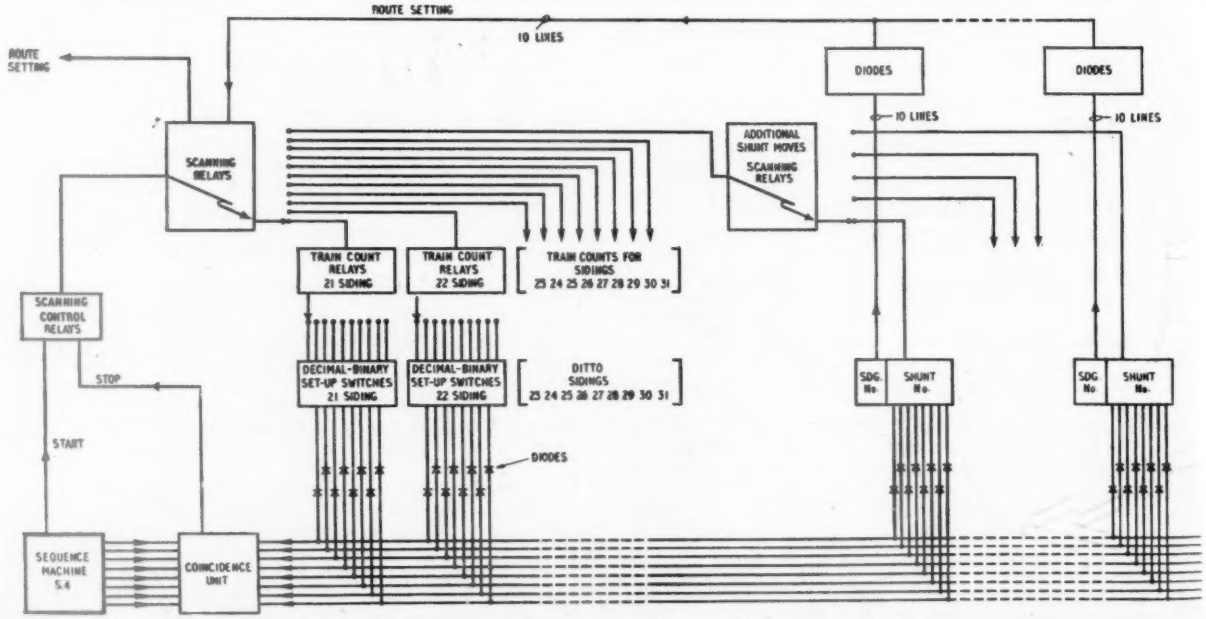
THE signalling on the London Transport Executive District Line from Earls Court to Putney Bridge is being modernised and the junction and point operation has been arranged to be automatically controlled by programme machines. The new signalling arrangements at Parsons Green were brought into use on the night of October 8/9 ready for the start of traffic on October 9, and those at Putney Bridge will follow in a few weeks' time.

The programme machines used are basically the same as those introduced on the Northern Line and at Watford on the Metropolitan Line in 1958, but important new features have been included in the present installation. The identification of all trains on the programme rolls is now by train number. This is punched on the roll in the form of a decimal-binary code used for reference purposes. A method of permitting some flexibility between the pre-prepared programme and the shunting movements on the ground at the Parsons Green sidings has also been included.

At Parsons Green there is a rolling stock depot with 10 sidings, but the working of the depot is made difficult because the sidings are located on both sides of the two running tracks and at both ends of the station, so that movement from one siding to another may mean routing a train which is being shunted to run for part of the distance over the main line. It is probable that most of the daily train movements and movements needed for the shunting of trains can be predicted, but there are, from time to time, variations in the pattern of traffic working into and out of the sidings, and a special shunt siding allocation panel has been installed to cover this feature of the working. The siding allocation panel is situated in the Yardmaster's office and is arranged to give a means of pre-setting the required movements. It also acts as a reference panel from which shunters or train staff can see the shunting movements which have to be carried out.

Remote Supervision Room

A supervision room from which the normally automatic signalling at Parsons Green and Putney Bridge can in emergency be controlled by pushbutton operation has been built at Earls Court. In connection with the new signalling arrangements, the signalboxes at Parsons Green and Putney Bridge are being closed and replaced by interlocking machines of the standard London Transport type



Block functional diagram, Parsons Green siding allocation panel

housed in specially-built relay rooms at the stations concerned. The interlocking machines are themselves controlled by programme machines housed in the same rooms.

Function of Programme Machines

The programme rolls used on the machines are of plastic material on which the details of each train to be dealt with are punched in proper sequence. The details include the destination of the train, its number in the working timetable, and the time of departure from platform starting signal or sidings as the case may be. The position of the holes in each line of coded information affects electrical circuits which set up the required route for each train. The machines are stepped from one line of information to the next by the passage of the train to which the route already set up refers, and are then ready to deal with the next train. These machines are known as sequence machines, and one is normally provided for each converging or diverging junction. The sequence machines do not themselves set up routes but give the necessary instructions to an interlocking machine of the normal London Transport type. The interlocking machines are similar to those controlled by push-buttons from a signalbox in many installations, and they ensure that the essential safety features and reliability of mechanical interlocking systems are fully maintained.

Time Machine

There is a second arrangement of programme machine, known as a time machine, which acts as a controlling clock. The time machine carries similar information to that on the sequence machine but is not stepped for the passage of each train: it is stepped after the lapse of time representing the interval between one train and the next. It counts in half minutes, the half-minute impulses being obtained from a master clock. The programme roll is coded to indicate the number of half-minutes between trains, and the time machine counts these half-minutes and then steps at the correct time. Thus the time machine catches up with the sequence machine only at the time the train is booked. When the programmes on both machines coincide, the necessary signalling movements are initiated. To keep the time machine programme rolls within convenient limits of complexity it is now usual to use one time machine for every two sequence machines.

The circuits controlling the programme machines are so arranged that after the last train of the day has passed the machines will automatically rewind the programme roll ready for the start of traffic the next day. Separate rolls are used for Saturday and Sunday working.

Parsons Green is a two-platform station with a complex of stabling sidings. These sidings are at both ends of the station and on both sides of the running lines, making four groups of sidings in all. They are known collectively as Parsons Green Depot.

All the movements required to provide service trains from the sidings and to stable trains going out of service are known and are shown in the timetable. Certain of the movements between one siding and another sometimes cannot be predicted until quite a short time before the movement has to take place, and while it is desirable to keep to a regular pattern of working, provision must be made for particular trains to be stabled in, or started out from, different sidings in special circumstances.

Preparation of Programme Roll

In preparing a programme roll, provision has been made for this complexity of working by punching on the roll not only all the timetabled movements but also additional punching in the form of a permission to shunt. These permission to shunt periods are each given an individual number similar to a train number, and use is made of the path by setting that number on the siding allocation panel. If a permission to shunt provided on the roll is not required, it is automatically stepped off the sequence machine by the time machine when the time allowed for this movement has expired.

There are four sequence machines at Parsons Green. Three of them are for the main-line movements and carry all the timetabled train movements, including, at certain times of the day, permission to shunt paths to allow trains to be shunted from one end of the station to the other in between passenger trains.

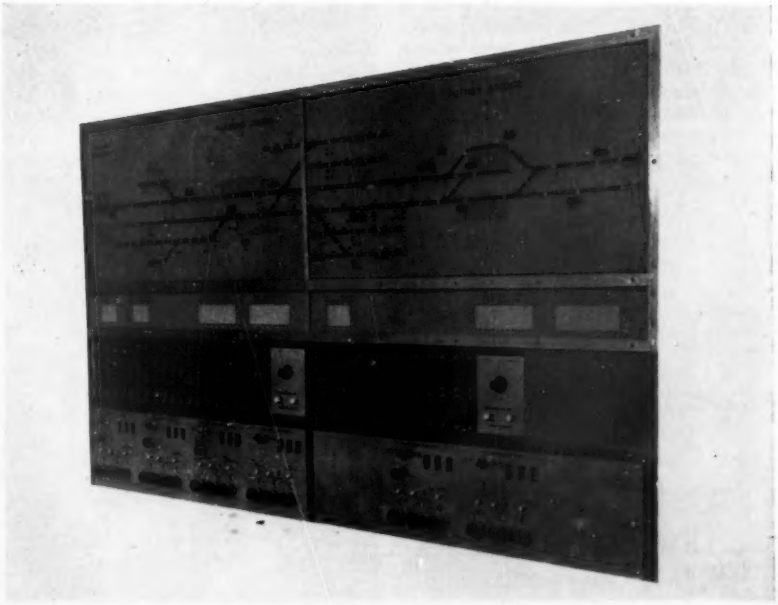
Machines 1 and 2 deal with the westbound trains, No. 1 bringing the trains into the station and No. 2 dealing with trains proceeding westward. No. 3 machine deals with trains on the eastbound road, and machine No. 4 is specially arranged to deal with the siding working only.

The provision of a special machine for siding working is necessary to enable the various possible changes in conditions to be met. It is essential that information from a programme machine should be available whenever a train which is required to be put into the sidings appears at Parsons Green Station. If this information were punched on the programme rolls of the main-line machines only, in the event of trains getting out of order and the siding train arriving early the information as to which siding it should enter would not be available on the main-line machine because it would read the passenger train particulars first. However, No. 4 machine only contains the information for siding trains and the details are therefore available whenever the siding train arrives.

The three main-line machines each step the programme forward for the passage of a train on the running lines, but No. 4 machine only steps the programme when a train actually enters or leaves the siding for a shunting path is utilised. It is this machine which operates in conjunction with the siding allocation panel.

Siding Allocation Panel

The allocation panel consists of a series of rotary switches arranged with dials so that on each set of three dials a train number can be indicated. A multiple of these train number dials, sufficient to meet the requirements of the programmed movements into or out of the siding for one day, is allocated to each siding, and there are 10 groups of these dials, one group being allocated to each of the 10 sidings. A special additional group of dial switches deals with the non-predictable shunt movements. These dials are not allocated to a specific siding, but are arranged so that on the three dials a train number and a siding number can be set. This group



Supervisory panel at Earls Court, showing signalling and programme machine controls and the track diagram

of switches can therefore be used for the setting up of additional shunt movements within the sidings when they are required for the marshalling of rolling stock.

When programme machine No. 4 refers to the siding allocation panel, offering a train number, this number is offered to each group of siding switches in turn by the scanning chain of relays. The next switch to be used in each siding group is switched in by a stepping circuit which disconnects the switches in turn as they are used. Lamps associated with the switches are illuminated to show those switches representing movements which have still to be used during the day. When the scanning chain reaches the special group of switches allocated to additional shunt movements, the scan pauses and a second chain of scanning relays is set in motion which offers the train number to each switch in turn in this group. In setting the panel for the individual sidings, the appropriate train movements must be set in chronological order, but in the additional shunt movement group it is not necessary, and by setting a siding number and a train number, the scanning circuit will find the train number and the route to the siding will be registered for the setting up of the signalling movement.

Setting of Panel

The weekday pattern of movements remains from day to day as set by the Yardmaster at the beginning of the week, except where modifications have had to be made to meet special circumstances. The panel must be re-set for Saturday and Sunday movements. The general rule in setting the panel is that, for service trains, the number is set for the siding from which the train starts on entering service or to which it must go when coming out of service. For shunting movements, the number is set for the siding to which the train is to move.

Each siding outlet signal at Parsons Green has an associated plunger which is operated by the driver or shunter who is to take charge of the train to be moved. This action not only indicates that the train is ready to proceed but also gives the necessary information as to the siding from which a shunting movement is to start; the siding at which it is to end is indicated by the panel setting.

There are two platforms at Putney Bridge. That for eastbound trains is served only by the through eastbound road but the westbound platform is an island platform served by the through westbound road and by a bay road which lies between the eastbound and westbound tracks. Facing points lead from the westbound track to the bay platform, and facing points from the bay road make a trailing connection with the eastbound track. There is a trailing crossover, between the east and westbound tracks at the west end of the station, which is not controlled by programme machine, but only by push-buttons in the supervision room at Earls Court. There are three sequence machines at Putney Bridge; the first, S1, is concerned only with eastbound trains from Wimbledon, which it offers to machine S2. This second machine deals with all eastbound trains and the converging junction between the eastbound and bay roads. Machine S3 controls the westbound facing junction between the through road and the bay and routes trains to the Wimbledon platform or the bay platform as required.

Supervision Room at Earls Court

The automatic operation of the signalling at Parsons Green and Putney Bridge is supervised from a temporary control room at Earls Court. A permanent control room will be built later. The room contains an illuminated diagram showing the signalling in the Putney Bridge and Parsons Green areas; a set of push-buttons for the manual control of the routes concerned, if circumstances require it; and switches for switching various programme machine conditions in or out. The push-buttons are fitted into a panel below the illuminated diagram. Beneath this main panel are six smaller panels associated with the four sequence machines at Parsons Green and machines S2 and S3 at Putney Bridge. Each of these six panels has a three-position switch for selecting normal programme machine working or push-button working. There are also controls for selecting out-of-turn working, acknowledging a warning that the programme-roll description of a train and train-describer description are at variance, and three rotary switches for selecting the number of a train to be cancelled.

By the use of appropriate switches in the supervision room at Earls Court, the following three conditions can be set up at Parsons Green or Putney Bridge:

(*a*) Normal programme machine working: everything will then run automatically in accordance with the working timetable.

(*b*) Should the train working on a section of line associated with a particular programme machine depart from the timetable, the equipment can be switched into train-describer and "first come, first served" working: the signalling will continue to work automatically, but trains will be signalled individually according to their destination (in the case of a facing junction) or their time of arrival (in the case of a converging junction).

(*c*) If it is necessary to deal with train movements not shown in the timetable, automatic working can be suspended for each programme machine individually and the routes concerned can be operated manually from push-buttons in the supervision room at Earls Court.

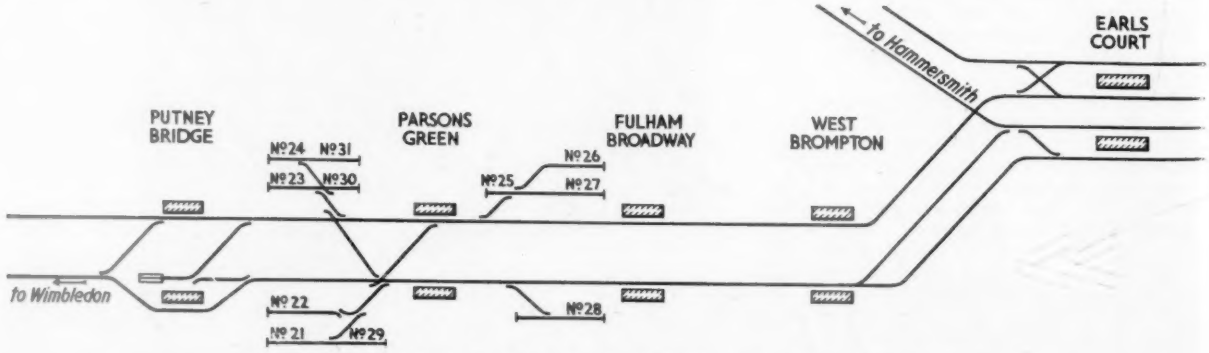
The programme machines can automatically take account of late running of trains and, if it exceeds a pre-determined amount, can despatch a train out of turn. A switch at Earls Court enables the degree of lateness to which the programme machine will respond to be selected.

Cancellation of Train

When a train is to be cancelled, the train number is set up by a group of switches at Earls Court, a separate group of switches being provided for each programme machine. When the number set up on the cancelling device coincides with that reached by the appropriate machine, the machine is stepped without a route being set up. The cancelling circuit is simpler than that used for the Northern Line installations, and it also allows the number of the cancelled train to be set up at any time before the train would normally have been dealt with by the programme machines.

The Putney Line programme machine installation was designed and installed by Mr. R. Dell, Signal Engineer, and his staff to the requirements of Mr. C. E. Dunton, Chief Civil Engineer, London Transport Executive.

The principal supplier of signalling equipment for the two installations was Westinghouse Brake & Signal Co. Ltd.



Track layout of Earls Court to Putney, Wimbledon branch, District Line

Visitors to the Electrification Exhibition at Battersea

At the stand of the Morgan Crucible Co. Ltd. (top left): Sir Brian Robertson, Chairman of the British Transport Commission, and Mr. J. A. Broughall, Electrical Engineer (Development), British Railways Central Staff; (above, left to right): Mr. A. Macmurdie of the Morgan Crucible Co. Ltd., Mr. Ernest Marples, the Minister of Transport, and Mr. S. B. Warder, Chief Electrical Engineer, B.T.C.; (below, centre, left to right): Mr. J. B. Douglas and Mr. H. May of the Morgan Crucible Co. Ltd., with Mr. B. N. Murti, Indian State Railways; (bottom left): Mr. A. Macmurdie and Mr. J. M. Frawley, Design Engineer in charge of overhead equipment, Victorian Railways; (bottom right): Mr. F. L. Netto, Chief Engineer, Metropolitan Railway of Lisbon and (right) Mr. H. May of the Morgan Crucible Co. Ltd.

Battersea and Brush Works Visits

(Top left): Sir Brian Robertson, Chairman, B.T.C., on the G.E.C. stand at the Battersea Exhibition. All the other illustrations show visitors to the Loughborough Works of the Brush Electrical Engineering Co. Ltd.—(top right): Mr. F. H. Wood, Brush, and Mr. A. F. Simpson (right), Rhodesia Railways; (centre, left to right): Mr. D. Ghitescu, Rumanian Ministry of Transport; Mr. F. H. Beasant, Brush; Mr. S. Pirinen and Mr. V. Lehmus, Finnish Railways; Mr. F. H. Wood, Mr. P. Grunfeld, H.S.B.I. Field Representative; (bending): Mr. G. Smith, Brush, and Mr. E. Lamminpaa, Finnish Railways. (Bottom, left): Mr. Smith and Mr. Beasant with Mr. G. C. Molyneux of Rhodesia Railways (centre). (Bottom right): Mr. Beasant and Mr. Smith with Mr. J. R. N. Torres (centre) of the Mexico-Chihuahua-Pacific Railway

Electric Repair and Inspection Depot at Ashford

Additional repair and inspection facilities for multiple-unit electric stock for British Railways, Southern Region, Kent Coast electrification scheme

General view of site looking south-east, with inspection shed in foreground

THE Kent Coast electrification scheme has made it necessary to provide additional repair and inspection facilities for multiple-unit electric stock. Before the opening of the first phase to Ramsgate and Dover, *via* Faversham in June, 1959, the steam carriage shed at Stewarts Lane, Battersea, was converted and extended as a combined inspection and servicing shed for electric stock. A new light lifting shed was constructed at Ramsgate, where the steam locomotive shed is also being converted and extended as an electric carriage inspection shed.

These do not provide all the requirements, and the scheme included a new repair shop with further inspection facilities. On considering all the factors involved, and bearing in mind the desirability of siting new workshops at places where redundancy of railway staff was likely to occur, because of changes in types of motive power contemplated under the modernisation plan, a site near Ashford was an obvious choice.

Location of Depot

A site known as Chart Leacon, situated on the up side of the main line on the London side of Ashford " B " Junction, and about ¾-mile from Ashford Station, was selected for the construction of a combined repair and inspection shed.

The repair shop will enable the overhauling of 300 four-coach units, both electric and diesel-electric, to be carried out each year, while the inspection shed, used for day-to-day maintenance and minor repairs, will contain four pitted roads, each capable of accommodating a four-coach unit.

The layout of the running line connections to the new repair shop and inspection shed has been designed to fit in with the scheme for the widening of the line, with contingent permanent way alterations, between the London side of Ashford "B" Junction and Ashford Station, which is being carried out concurrently, connections being laid to the new up and down passenger loop lines. An additional connection to the up main line at the west end is also being installed.

Two stores sidings and a group of five sidings outside the east end of the repair shop are being laid in, to accommodate 13 four-coach units awaiting repairs, inspection, or their return to traffic.

Approximately 200 staff will be employed in the new repair shop and inspection shed, a small number being transferred from their existing depots to form a nucleus for the training and supervision of the remainder.

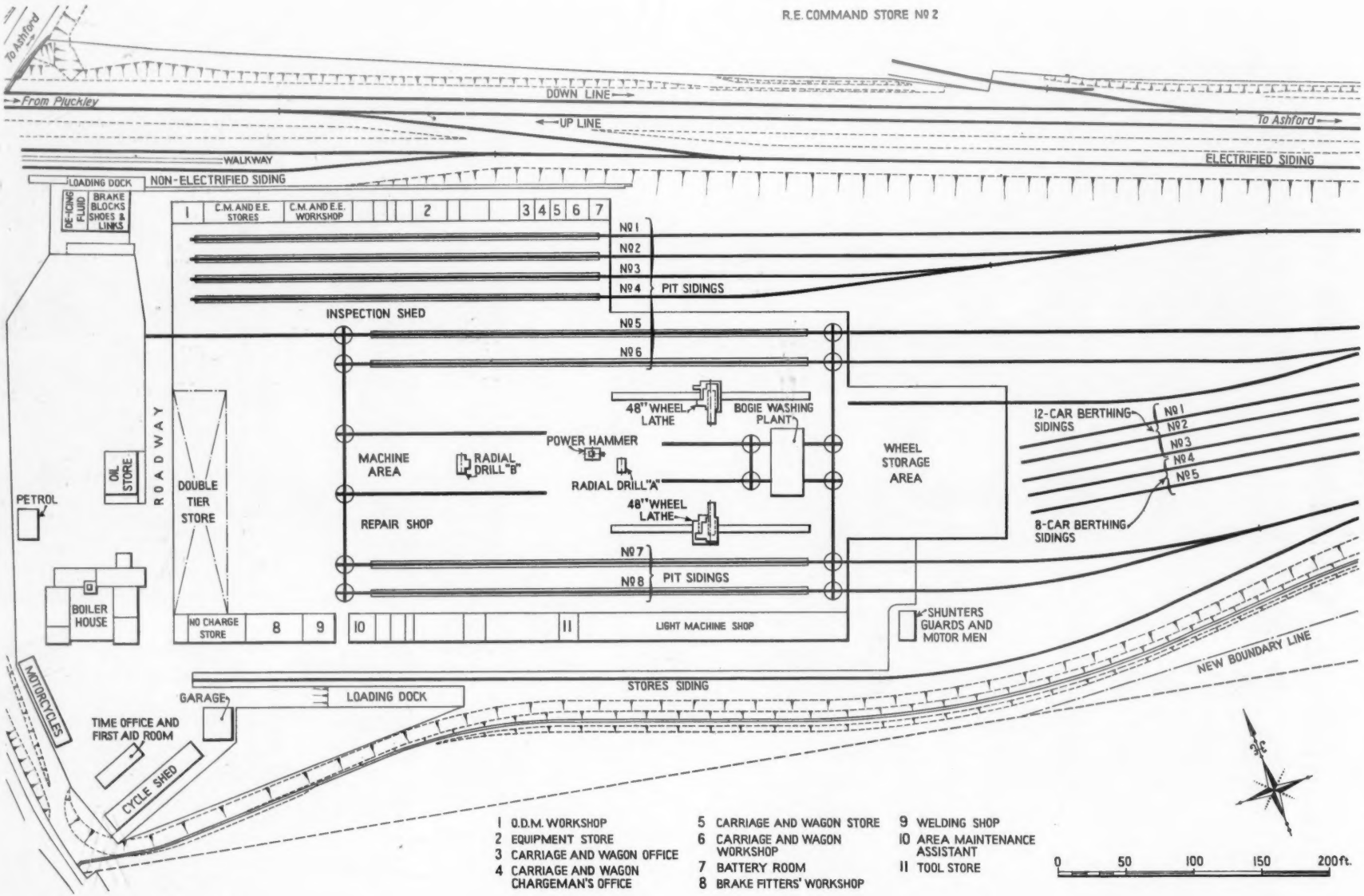
Repair Shop

The repair shop, 496 ft. long by 220 ft. wide and 36 ft. high at eaves level, consists of four bays each of 55 ft. span. The two centre bays are extended a further 116 ft. 8 in. to form a covered wheel store. It is made up of four-bay continuous steel portal frames, spaced at 29 ft. 2 in. centres, with intermediate portal frames supported by valley beams and external stanchions.

The roof covering is of double asbestos cement sheeting with an intervening layer of 1-in. insulating material, and natural lighting is provided by two rows of continuous patent glazing 9 ft. 6 in. deep in each bay. The floor is generally of concrete 9 in. thick with a 2 in. granolithic finish, but over areas used for motor and bogie repairs, and the heavy machine shop area, a wood block flooring surface will be installed 4 in. thick.

The repair shop will provide facilities for overhauling the bogies, brake gear, and underframe mounted equipment on electric and diesel-electric multiple-unit trains. The two outer bays each span two pitted running roads, on one of which incoming coaches for overhaul are lifted off their bogies by two 25-ton electric

Inspection pit in repair shop



Layout of workshop, inspection shed, and sidings, showing arrangement of mechanical plant

overhead travelling cranes and then lowered on to previously overhauled bogies positioned in readiness on the adjacent road. After the transfer of bogies has been completed, the brake rigging is re-conditioned and underframe equipment requiring repair is exchanged for overhauled components.

Following the removal of the traction motors from the motor bogies, all bogies for overhaul pass through a cleaning plant before de-wheeling, stripping, inspection and re-assembly. All this work will take place in the two centre bays. The movement of wheeled bogies between bays is facilitated by the use of 12 electrically-operated turntables, placed at both ends of the four running roads and bogie overhaul roads, all of which are inter-connected via the turntables by a cross road at each end of the shop.

Electric Overhead Cranes

Two 15-ton electric overhead travelling cranes are installed in each of the two centre bays and each will have a higher speed 5-ton hoisting motion to the crane hook. These cranes will facilitate the bogie overhauls and those at the rear or closed end of the shop will assist with traction motor, motor-generator set, and compressor overhauls.

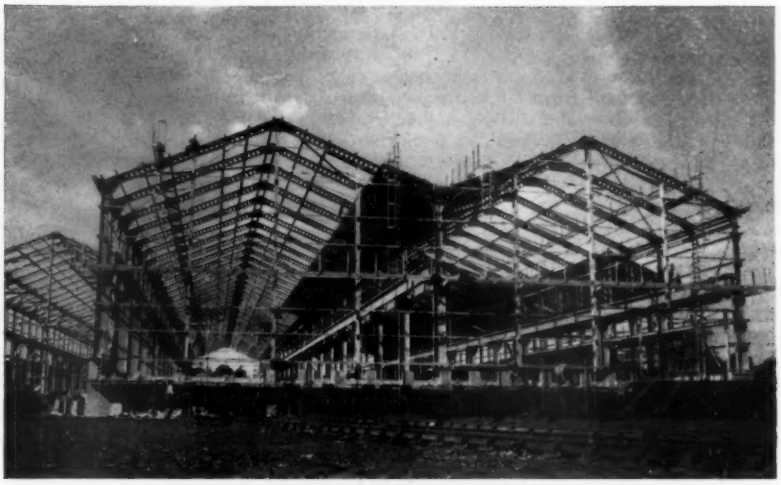
A small number of machine tools, together with a welding bay and smithy, are installed down the centre line of the shop, and others in the machine bay at one side of the shop, all of which will be used in the production of new and the reconditioning of worn parts.

Two wheel lathes will be supplied to restore the tyre profiles on worn wheel sets. These machines will be floor mounted and the wheel sets will be lifted into the machines and retained between centres entering the ends of the axle. The cutting cycle will be automatic once the operator has set the machine to the desired depth of cut.

Bogie Cleaning Plants

Two bogie cleaning plants, one to each centre bay, will be installed. Each plant will have two tanks with a total capacity of some 6,000 gal. of liquid. This can form either a washing solution or wash and rinse solutions. The liquid will be sprayed under pressure on to the bogie previously drawn into the cleaning chamber which will be ventilated outside the shop. The foul solution from the chamber will return to the main tanks for re-circulation. Each tank is fitted with filters and sludge removing equipment to dispose of the solids content in the cleaning liquid. Provision is made for heating the cleaning solution to a maximum temperature of 85°C. by steam heating coils within each tank. On completion of the cleaning process, the bogie will be automatically withdrawn from the plant into the shop for the overhaul process to continue.

The adjacent inspection shed will cater for the routine maintenance in the form of minor adjustments to mechanical and electrical equipment, renewal of worn brake blocks, and bearing lubrication, on four coach units.



Shed under construction, showing erection of steel framing

Against two-thirds of the west end wall of the repair shop, and within the shop, a main stores block is being constructed 165 ft. long and 40 ft. wide having a clear headroom of 10 ft., with a concrete floor above, designed to carry 2 cwt. per sq. ft., for the storage of heavy materials. An opening 8 ft. sq. in this floor will enable transfer from the ground floor of the store to the storage area by the overhead travelling cranes. An external staircase also gives access to the storage area from the shop floor. Hand railing is fitted to allow maximum clearance when loads are deposited or removed by overhead cranes.

On the south side of the repair shop, an annexe 20 ft. wide will house a brake fitters' workshop, welding shop, and a light machine shop, the latter forming an alcove bay of the main shop. This annexe will also contain offices for a storekeeper, and supervisory staff, together with lavatories, locker rooms, and tool stores. On the south side of the annexe and separated from it by a concrete roadway is a stores road equipped with a loading dock and a short concrete apron.

Inspection Shed

The inspection shed, forming a fifth bay on the north side of the repair shop, is 320 ft. long and has an internal width of 69 ft. 6 in. It has four roads spaced at 15 ft. centres each pitted for a length of 292 ft. An area has been reserved for the future extension of this shed to take 12-car trains should this prove to be necessary. The inspection pits, of Southern Region standard design, have drainage, low-voltage power points, and bulkhead lighting.

Cladding and lighting of roof and exterior walls are similar to the repair shop, except that single-skin corrugated asbestos sheeting is used because the shed will not be heated and will be open at one end. The floor will be of concrete, lightly reinforced, surfaced with 2 in. granolithic finish, and cambered between tracks. The minimum thickness is 11 in. Overhead conductor wires and electric trolleys are being installed to enable stock to be moved within the shed area. An annexe 14 ft. wide against the external face of the north wall, provides accommodation for workshops, stores, calorifier room, office lavatories, locker rooms, and so on.

Alongside and at a higher level, a short siding is being installed to house a conductor rail de-icing train, and between this and the shed is a non-electrified siding for the unloading of brake blocks, de-icing fluid, and other miscellaneous stores. No mess rooms are included in the staff accommodation at this depot as arrangements are in hand for the construction of a canteen as a separate scheme.

Site Conditions

The site, which is triangular in plan, lies between the main line and the River Stour, and is bounded at its west end by the A.28 road from Canterbury via Ashford to Hasting. Borings showed the ground to have an average thickness of 9 ft. of alluvial clay overlying the Weald clay, and because of the heavy loading of $\frac{3}{4}$ ton per sq. ft. required over the area of the repair shop floor the alluvial clay was excavated over this site and replaced with imported Hassock sand fill and Hoggin rolled to give 95 per cent compaction at optimum moisture content. In all, 100,000 cu. yd. of alluvial clay was excavated, of which some 60,000 cu. yd. was replaced by Hassock and Hoggin filling up to the underside of the repair shop floor. Much of the surplus excavated material was used as filling over the site of the sidings and connections.

Preparation of Repair Shop Area

For ease of construction, the fill over the repair shop area was carried out in two stages, the first being levelled off to the underside of the inspection pits, which were first constructed before completing the filling to the underside of floor level. Loads from the steel portal frames are carried on 24-in. dia. bored piles, two to each base, while

15-in. dia. bored piles are used as intermediate supports for the concrete wall beams, and intermediate stanchions. These vary in length from 63 ft. for an 85-ton load to 40 ft. for a 40-ton pile load, the lengths being determined from results obtained from pile loading tests carried out on the site. In all 215 24-in. piles and 105 15-in. piles were driven on the site of the shed. To prevent settlement of the brickwork of the outer shed walls, relative to the steel superstructure, this is carried on concrete beams spanning between pile caps and cast integrally with them.

On the west and north sides of the main building, to consolidate the ground for storage and as a working area during construction, a 6-in. layer of compacted sand and 6 in. of stabilised sand was laid, the latter being stabilised by the addition of cement, 10 per cent by weight of the dry sand. This was finally sprayed with tar and surfaced with ⅜ in. stone chippings. This proved very successful and stood up well to the wet weather experienced in the winter of 1959–60.

Two ft. of track blanketing material is being laid under all external sidings, consisting of 6 in. of coarse charing sand directly on the formation surmounted by 6 in. of ashes, followed by either 12 in. of ashes or 12 in. of track ballast to the top of sleepers, the latter being used where sidings are to be electrified. On slow-running lightly-used sidings, however, it was later agreed to replace the bottom 6 in. layer of coarse charing sand by a similar thickness of fine grade ashes.

Steelwork

The four-span steel portal framing is, with the exception of site joints, of all-welded construction, with fully fixed bases. The lower legs of the frame consist of 24 in. x 12 in. universal beams. The roof legs are 15 in. x 6 in. rolled steel joists and the rafters are formed from 10 in. x 6 in rolled steel joists, castellated to give an overall depth of 15 in., these being spliced 8 ft. 6 in. from the top of the portal leg on site with high-strength bolts. The welded gantry beams, composed of 30 in. x 10½ in. universal beams, 15 in. x 4 in. rolled steel channels, and 56-lb. bridge rails, are carried on cantilevered brackets welded to the tops of the 24 in. x 12 in. portal legs. Each intermediate portal frame is carried on valley beams 18 in. x 7½ in. x 55 lb. which are bolted between the main columns.

Rafter bracing is provided transversely at each end of the shed and at two intermediate points. Additional bracing is also provided longitudinally along the sides. The inspection shed is also of all-welded steel frame construction, the roof in this case being carried by single-span ridge type roof trusses of conventional design, the height to eaves being 17 ft. The trusses of 69 ft. 7 in. span are spaced at 14 ft. 7 in. centres.

The floors of both the repair shop and inspection shed are of concrete, lightly reinforced, 11 in. thick including 2 in. of granolithic surfacing. In the repair shop the floor is laid level, whereas in the inspection shop the surface is cambered 1 in. between the tracks.

The heating of the main portion of the repair shop is by medium-pressure steam radiant panels suspended from the structure, and which are grouped for control to give maximum efficiency and economy. Each group, as well as being thermostatically controlled, is capable of isolation when any particular area is not in use.

Steam for the panels is supplied by two 8,000-lb. per hr., triple-pass wet-back oil-fired boilers operating at 120 lb. per sq. in. The fuel for the rotary cup burners is 950 sec. oil. A small gas boiler supplies the summer hot water service load in the staff accommodation. All staff accommodation is heated by low-pressure hot water steel radiators from a steam/water calorifier. A composite control panel controls the heating.

Ventilation of Shed

General ventilation of the shed is by 18 glass-fibre roof extract units and 15 input units to supply fresh external air through vertical discharge ducts. The main function of these units is to provide air turbulence within the shed. Special extract plant is installed to remove the fumes and water vapour from the bogie washing plants. Other special units remove welding fumes from the blacksmiths' hearths, muffle furnace and battery charging room.

The repair shop lighting is by contactor-controlled 400 and 700 W. colour-corrected mercury-vapour lamps and high-bay lighting units. Walkway lighting in the pits is by recessed bulkhead fittings. The inspection shed illumination is by fluorescent units suspended between the roads, with bulkhead lights within the inspection pits. Low-voltage socket outlets are also fitted in recesses in all pits for hand tools, and similar sockets are suspended from an overhead busbar system in the inspection shed. Higher levels of local illumination on machines is provided where necessary by low-voltage units. Tungsten lighting is provided in the staff accommodation and the light machine workshop area.

Distribution of Electric Power

Power busbar trunking is distributed throughout the repair shop and inspection shed, fuse tap off units being fitted at 2 ft. intervals for supplying the electrical machines and equipment in the repair shop. Heavy duty industrial socket outlets with integral interlocked switch and earth proving controls are fitted for portable mains voltage equipment.

The entrance to the depot for staff and road transport is from Beaver Lane at the south-west corner of the site, adjoining which will be constructed a gate house and first aid room, a double garage for lorries and shelters for cycles and motor cycles. Near this spot is the boiler house, with which is incorporated a sub-station with an adjoining uncovered transformer compound. This building is of 15½-in. and 11-in. cavity brickwork carried on concrete beams, which are in turn supported on 15-in. bored piles. Besides the two economic type boilers, this building also houses an incinerator room, oil pump room, a small mess room for the attendant and a calorifier room. Also incorporated is an external compound containing two 7,000 gal. fuel storage tanks.

Oil Storage

The oil store, a separate building about 50 ft. north of the boiler house, has a main floor raised to the same level as the external loading dock on which barrels can be unloaded from lorries. These can be traversed into the building by an overhead runway. Storage tanks will be installed in the basement and provision made for filling *via* piped connections from road tankers. Oil as required can be delivered from the tanks below to the main floor above. Near the north-east corner, and with a loading dock alongside the store siding, is a separate single-storey store for the storage of brake blocks and de-icing fluid. There is also a petrol store in this area. A small brick building near the south-east corner of the repair shop is being constructed for the use of shunters and visiting guards and motormen.

From the main gateway a 20-ft. concrete roadway passes along the west side of the building, giving lorry access to the main stores and the adjacent uncovered storage areas. A similar roadway extends along the south side of the building terminating in a turning area, which enables stores to be delivered direct into the repair shop at the east end.

Work at site began in May, 1959. The inspection shed is programmed to be completed by June, 1961, and the whole of the work a few weeks later. The general scheme and design of the civil engineering and building work were formulated under the direction of Mr. A. H. Cantrell, Chief Civil Engineer, British Railways, Southern Region, to the requirements of Mr. W. J. A. Sykes, Chief Mechanical & Electrical Engineer, Southern Region. John Mowlem & Co. Ltd. was engaged as design contractor for the detailed design and execution of the works.

The principal sub-contractors are as follow :

Piling	Soil Mechanics Limited
Steel framing	Tees-side Bridge & Engineering Works Limited
Cranes	Vaughan Crane Co. Ltd.
Wheel lathes	Craven Bros. (Manchester) Ltd.
Bogie cleaning plants ...	Magnus Chemical Co. Ltd.
Turntables	John Boyd (Engineers) & Co. Ltd.
Heating	Haden & Company
Lighting and electrical installation	Bective Electrical Co. Ltd.
Ventilation	Brooks Ventilating Company

ESCALATOR UNDER MAINTENANCE CAUSED ACCIDENT.—An escalator, which had been stopped for maintenance and was in use as an ordinary staircase, started to move, and a number of people were thrown to the ground at Oxford Circus Underground station on Saturday, October 1. Eleven people were taken to hospital with slight injuries. As the switch which sets the mechanism in motion is in a chamber under the escalator and is therefore inaccessible to the public, the cause of the accident is obscure.

RAILWAY NEWS SECTION

PERSONAL

Mr. Ajit Kumar Mullick has been appointed Senior Deputy General Manager, South Eastern Railway of India, and Mr. V. K. Rangaswami has been appointed Chief Commercial Superintendent of that railway.

Mr. R. M. Robbins, Secretary & Chief Public Relations Officer, London Transport Executive, who, as recorded in our September 23 issue, has been appointed Chief Commercial & Public Relations Officer, was educated at Westminster School, Christ Church, Oxford, and the University of Vienna. He joined the London Passenger Transport Board in September, 1939, and, after war service in the Transportation Branch of the Royal Engineers, in which he attained the rank of major, returned to London Transport in April, 1946, and joined the Public Relations Department. He was appointed Secretary to the Chairman in the following year and in 1950, became Secretary to the Executive. In June, 1955, he was appointed Chief Public Relations Officer in addition to his duties as Secretary which he now relinquishes to take up his new responsibilities.

Mr. R. M. Robbins
Appointed Chief Commercial & Public Relations Officer, London Transport Executive

Mr. S. G. Jones
Appointed Secretary to the London Transport Executive

Ing. Nicolas O. Ferramola and Ing. Hortensio H. Vilaseca have resigned their posts as Administrators of the General Bartolomé Mitre and General Roca Railways, Argentina, and have been replaced by Ing. D. A. Feliú Badaló and Ing. Carlos F. D'Alesio, respectively.

Mr. F. Lemass, General Manager of Coras Iompair Eireann, has been elected Chairman of the Conference, Irish Railway Clearing House.

Mr. R. Ellis has relinquished his executive duties as General Manager of British United Traction Limited, but has been appointed to the board of Directors in an advisory capacity. Mr. F. G. Headen has taken over Mr. Ellis's executive duties, with the title of Manager.

Mr. C. T. Cameron has been appointed Assistant Chief of Car Equipment, Canadian National Railways.

We regret to record the death of Mr. F. Lockwood, former London Cartage Manager, Kings Cross, Eastern Region.

Dr. M. E. Beesley has been appointed Rees Jeffreys Research Fellow in the Economics & Administration of Transport at the London School of Economics & Political Science.

Sir William Mabane, former Minister of State, has been appointed Chairman of the British Travel & Holidays Association. He succeeds Sir Arthur Morse, who has completed a six-year term of office.

Mr. W. J. Thomas is retiring from the position of Managing Director of the British Aluminium Co. Ltd. at the end of this month. He will continue to be a Director of the company and of certain subsidiary and associated companies. Mr. J. J. Boex is resigning as a Director and executive of the company.

Mr. A. V. Hichisson, Publicity Manager, Westinghouse Brake & Signal Co. Ltd., is retiring at the end of this month.

Mr. S. G. Jones, Legal Adviser to the London Transport Executive, who, as recorded in our October 14 issue, has been appointed Secretary to the Executive, entered the Legal & Parliamentary Office of the Underground Group of Companies in 1929 and, on the formation of the London Passenger Transport Board in 1933, was transferred to the Office of the Solicitor to the Board. He was admitted as a Solicitor in 1938. In October, 1947, he was appointed Acting Assistant Solicitor (General), and in April, 1948, was made an Officer of the London Transport Executive and confirmed in the appointment of Assistant Solicitor (General). He became Solicitor to the Executive in December of the same year. On the formation of the British Transport Commission Legal Service in 1950, Mr. Jones was transferred to that Service and was appointed to the position of Legal Adviser to the London Transport Executive, the appointment which he now relinquishes to take up his new duties with the Executive.

We regret to record the death of Mr Hubert E. Cox, formerly Deputy Chief Engineer (Signals), of the Great Indian Peninsula Railway.

Mr. D. W. Brisbane, C.B.E., M.I.C.E., M.I.St.E., M.I.E. Aust., former General Manager & Local Board Chairman of the Midland Railway Co. of Western Australia Ltd., whose death was recorded in our September 23 issue, was born at Melbourne, Victoria, in 1888, and came to Western Australia in 1895. In 1908 he was appointed to a Civil Engineering Cadetship in the Public Works Department of Western Australia under the late James Thompson, Engineer in Chief. On the completion of his training in 1912 he was appointed an Assistant Engineer in the Public Works Department, and employed on railway construction until 1919, when he accepted a position with the Government of the Federated Malay States as Railway Construction Engineer. In 1923 he established Fogden, Brisbane & Co. Ltd., Singapore, of which he became Managing Director. The company carried out many public works, including two bridges over the Singapore River. On the outbreak of war with Japan, he joined the Royal Australian Navy and served until 1943, when he was released to take over the management of the Midland Railway Co. of Western Australia Ltd. In 1946 he was appointed Chairman of the Local Board of Directors of the company, in addition to his duties as General Manager. Four years later he retired from the position of General Manager, but remained Chairman of the West Australian Board of Directors of the company. In 1951, at the request of the Western Australian Government, he reported as an independent engineer on the proposed routes for the Welshpool–Bassendean Railway and, in 1952, in conjunction with the Co-ordinator of Works & Industrial Development, on the changes in the Fremantle Harbour Development. Mr. Brisbane was Chairman of the boards of several companies in Western Australia, a Director of others, and President of The Australian Institute of Management (Perth Division).

The late Mr. D. W. Brisbane
Former General Manager, the Midland Railway Co. of Western Australia Ltd.

Mr. E. D. Trask
Assistant to the General Manager (Special Duties), Eastern Region, 1959–60

Southern Region Appointments

The following appointments have been announced by British Railways, Southern Region: Mr. H. C. Walter, Assistant (Long-Term Traffic Intelligence), Office of Commercial Officer, Waterloo, to be Passenger Assistant, Waterloo; Mr. C. W. Ralls, Chief Clerk, Treasurer's Department, Deepdene House, to be Assistant Treasurer, Southern Region; Mr. A. T. Ing, Shedmaster, Stewarts Lane, to be Assistant to Motive Power Officer, Waterloo.

Mr. J. Gibson, has been appointed Managing Director of The Consolidated Pneumatic Tool Co. S.A. (Pty.) Ltd., Johannesburg.

Mr. G. H. Lowthian has been elected Chairman of the Industrial Training Council.

Transport Users' Consultative Committee North Western Area

The following have been appointed to be Members of the Transport Users' Consultative Committee for the North Western Area until June 30, 1963:—

Members

*Mr. G. K. Tatterson, representing industry; Co. Alderman W. Ellison, representing local authorities; Mrs. M. McMillan, additional Member.

* Indicates a new Member.

Mr. J. H. Richardson, Traffic Manager of the Northern General Transport Company Limited, has been appointed General Manager, East Midland Motor Services Limited.

Crompton Parkinson Limited has announced the following appointments: Mr. A. S. Duncan has been elected to the board of the Young Accumulator Co. Ltd.; Mr. A. E. Gregg has been appointed to the board of Crompton Parkinson (Chelmsford) Limited; Mr. J. C. Mansfield, and Mr. D. Ebben have joined the board of F. & A. Parkinson Limited; Mr. K. Younger has been appointed to the boards of Crompton Parkinson (Chelmsford) Limited, The British Electric Transformer Co. Ltd. and Cooke & Ferguson Limited.

Mr. E. D. Trask, M.I.Mech.E., Assistant to the General Manager (Special Duties), British Railways, Eastern Region, who, as recorded in our October 7 issue, has retired, entered the Doncaster Works, Great Northern Railway, under the late Sir Nigel Gresley, in 1911. During the 1914-18 war he was commissioned in the Royal Field Artillery, and subsequently in the Royal Flying Corps and Royal Air Force. He rejoined the Great Northern Railway at Ardsley (Leeds) and was subsequently transferred to Kings Cross. In 1923 he was appointed Assistant District Locomotive Superintendent, Neasden, London & North Eastern Railway, and three years later became a technical assistant to the Locomotive Running Superintendent, Southern Area, L.N.E.R. After service at Grantham and Peterborough, he was appointed District Locomotive Running Superintendent, at Gateshead, in 1934, and of the combined districts of York & Leeds in 1937. In 1938 he became Locomotive Running Superintendent, Scottish Area, and retained that position until the nationalisation of the railways. He was appointed Motive Power Superintendent, Scottish Region, in January, 1951,

The late Mr. A. E. Tattersall
Assistant Chief Engineer (Signals), L.N.E.R., 1943-47

Mr. C. H. Clarke
Appointed Treasurer, British Railways, Southern Region

Mr. K. D. Rhodes
General Assistant (Maintenance & Organisation), Chief Civil Engineer's Department, W. Region

and in February, 1954, he became Motive Power Superintendent Eastern Region. He was appointed to the position from which he has retired in July, 1959. During the 1939-45 war, Mr. Trask was closely connected with the Home Guard and commanded the 10th Battalion, Royal Scots (H.G.). He is a Member of the Council of the Institution of Locomotive Engineers.

Mr. A. E. Tattersall, M.I.E.E., F.Inst.P., Assistant Chief Engineer (Signals) of the former L.N.E.R. whose death was recorded in our October 7 issue, began his railway career in the Signalling Department of the Lancashire & Yorkshire Railway. In 1906 he was appointed Chief Assistant to the Signal Superintendent, Great Southern & Western Railway (Ireland). The following year he joined the Metropolitan Railway as the Signalling & Electrical Assistant to the Engineer, and he was responsible for the changeover from mechanical to all-electric power and automatic signalling throughout the electrified area. He was connected also with the installation of automatic signalling on the East London Railway; the latter and the Baker Street installation were the first in this country where a.c. track circuits were employed on a large scale. He was responsible also for dispensing with the usual facing point locking bar in track-circuited installations. From 1915 to 1919 he held a commission in the R.A.O.C.; and in January, 1921, he was appointed Signal Superintendent to the Engineer, Great Northern Railway, in which position he was responsible for the introduction on a large scale of power-operated outlying points and signals, and for the reversible working and three-position signalling through the Gas Works Tunnel at Kings Cross. In 1924 he became Assistant Signal Engineer, Southern Area, L.N.E.R., and in 1928 he was appointed Signal & Telegraph Engineer, North Eastern Area. Subsequently Mr. Tattersall was responsible for the design and supervision of the installation of colour-light signalling on the main line between York and Northallerton, and elsewhere. He was associated, in the N.E. Area with the introduction to this country of approach lighting, intermittent track circuiting for the control of single line, and with the extended use of mechanical colour-light signals. He was also responsible for the installation of a new method of branch line signalling on the Boroughbridge branch, and for the introduction of carrier way telephony and modern teleprinters between York and Newcastle. In 1936 he became Signal & Telegraph Engineer, Southern area. He was responsible for the successful conversion of the majority of the Southern Area telegraph trunks to a teleprinter network and automatic switching in connection therewith. He was responsible also for the introduction of the sequence switch interlocking. He was appointed Assistant Chief Engineer (Signals) in 1943. Mr. Tattersall was elected a Fellow of the Institute of Physics in 1933, was President of the Association of Railway Companies' Signal Superintendents & Engineers in 1919 and was a member of the Signal and Telegraph Sections of the Association of American Railroads. His book, "Modern Developments in Railway Signalling" was published in 1921 by *The Railway Gazette*. He was keenly interested in the training of the staff both in the N.E. and Southern Areas, L.N.E.R. The course of lectures given to the staff in those areas was so successful that they were reprinted in book form, under the heading "Railway Signalling and Communications" (published by *The Railway Gazette*). He was awarded a Webb Prize by the Institution of Civil Engineers for his paper, read before that Institution in 1942, on "Railway Signalling and Communications."

Mr. C. H. Clarke, Assistant Treasurer, Southern Region, who, as recorded in our August 26 issue, has been appointed Treasurer, Southern Region, was educated at Tiffin School, Kingston-on-Thames. He entered the service of the London & South Western Railway Company as a Junior Clerk in 1920, and spent the first ten years of his career at Nine Elms Goods Depot. In 1930 he was transferred to the Treasurer's Department at Waterloo Station. During the following 20 years Mr. Clarke had experience in the Divisional Offices of the Department. In 1953 he was appointed Clerk in Charge of the Woking Office, and in 1955 he was promoted to the position of Chief Clerk of the Department. He was appointed Assistant Treasurer of the Southern Region in 1957.

Mr. D. Scott has been appointed Sales Director of Morganite Crucible Limited.

Mr. K. D. Rhodes, A.M.I.C.E., District Engineer, Cardiff, British Railways, Western Region, who, as recorded in our October 7 issue, has been appointed General Assistant (Maintenance & Organisation) in the Chief Civil Engineer's Department, Paddington, studied at the Regent Street Polytechnic, London, and joined the Great Western Railway in the Chief Engineer's Office, Paddington, in 1936. He served in the New Works Drawing Office before joining the Resident Engineer's staff, and was engaged on the electrification of the Central London Railway from North Acton to Greenford. He was commissioned in the Royal Engineers and posted to the Middle East in 1940. In 1941, he was seconded to the Sudan Railways as Assistant Engineer, and subsequently became Resident Engineer. He was recalled to military duty in 1943, and served in Sicily and Italy as Adjutant, 1212 Railway Construction & Maintenance Group, R.E. In 1945 was appointed Staff Captain, Railway Construction, War Office, and was Mentioned in Dispatches for distinguished services in Italy. He returned to the Great Western Railway in January, 1946, served in the District Engineer's Office, Neath, and was appointed Assistant to the Divisional Docks Engineer, Barry Docks, in October of the same year. In 1947, he became Resident Assistant Engineer, Newport Docks, and was appointed Assistant in the District Engineer's Office, Newport, in 1949. He was appointed Assistant District Engineer, Cardiff Valleys District, in 1951, and later became Assistant District Engineer, Newport. He was made Organisation & Methods Assistant, Paddington, in January, 1956, and District Engineer, Cardiff, in April, 1959.

Mr. R. Wonfor, Sales Director of Vickers-Armstrongs (Engineers) Limited, has been appointed Chairman of Metchair Limited.

Mr. A. W. Williams has been appointed Chief Technical Representative in charge of the Technical Sales Service Department of James Booth Aluminium Limited.

Mr. W. J. Renton has been appointed General Shipping & Traffic Manager of Massey-Ferguson Limited and Mr. G. E. Dix has been appointed General Purchasing Manager of the company in the United Kingdom.

NEW EQUIPMENT AND PROCESSES

Rubber Drum-Sander

A HIGH-SPEED rubber drum-sander for use with portable tools makes use of the action of centrifugal force to secure the sander in position during operation.

The abrasive-cloth band is easily slipped on to a slotted drum mounted on the portable tool, but is securely held during rotation. Mechanical deformation of the rubber is thus avoided, and it is claimed that the working face of the band remains true, allowing full and efficient use of the whole width. Grit changing is greatly simplified as no tools are needed. Improved cutting properties also are claimed from the use of higher rotational speeds.

The slots in the drum have the additional effect of introducing air behind the abrasive band to assist in cooling. The sanders are being produced in three sizes: 1-in., 2-in., and 4-in. dia.

Further details may be obtained from B. O. Morris Limited, Morrisflex Works, Briton Road, Coventry.

Drilling Machine with Auto-Indexing Rotary Table

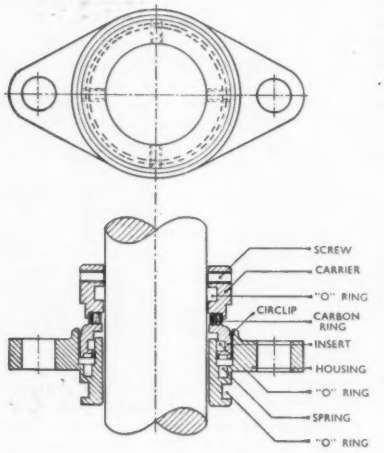
THE Archdale single-spindle verticle drilling machine No. 14780, equipped with automatic indexing rotary table on hydraulically-traversed slide, drills up to 2¼ in. dia. in mild steel on a minimum of 9-in. and a

maximum of 40-in. pitch circle diameter. It can be adjusted to perform any of the following operations for rapid production work in railway and other workshops; fully automatic drilling and pitch-controlled tapping; fully automatic drilling with manual pitch-controlled tapping; fully automatic drilling and hand feed for tapping and spot-facing. All operations are with automatic indexing table cycle.

The rotary table is 36 in. dia. and the slide is so arranged that material can be loaded by crane, clear of the spindle head The table-indexing mechanism consists of reduction gearing and an 80: 1 worm and worm-wheel driven by a ½-h.p. motor. A "single revolution" clutch is provided, which is arrested and located at the stop position, this determining the table indexing position. The clutch is driven through counter gears to make the number of revolutions required for the selected number of indexing positions. For the complete range of index positions seven pairs of counter gears and 14 index-change gears are provided.

Four ranges of spindle speeds are provided, with 12 speeds in each range, supplied by a 5-h.p. motor through a quick-change gearbox. Feeds are by hydraulic means and infinitely variable. They are controlled by trip dogs on the side of the head to give an automatic cycle of : fast advance ; feed ; fast return.

Further details may be obtained from the manufacturer, James Archdale & Co. Ltd., Ledsam Street, Birmingham, 16, or from the sole agent, Alfred Herbert Limited, Coventry.



Shaft Seal

THE J6 shaft seal can be supplied for external or internal fitting as a self-contained unit requiring neither lubricant nor coolant and is capable of standing up to speeds of 3,000 ft. per min. It can be fitted to most pumps, compressors, and mixers without any alteration to existing fittings. It is balanced and therefore suitable for pulsating pressure between 500 lb. per sq. in. and 29 in. Hg. vacuum.

Pressure between the sealing faces is low and it is claimed that the power wastage is so small that sealed uncoupled shafts of up to 6-in. dia. can be spun by hand. There is no wear on moving parts of the shaft and misalignment of up to 2 deg. can be accommodated to allow for shaft-whip. The J6 seal is particularly suited to applications involving the handling of petroleum products and other volatile liquids for which the temperature rise at the seal must be a minimum. It can be used for alternating wet and dry running or continuously in either condition. Standard external sizes range from 1 in. to 4 in. shaft size for stuffing boxes 1¾ in. to 5¼ in. bore and cost from £11 to £28 17s. 6d.

Further details may be obtained from J. A. Cannings Limited, St. Johns Road, Bath, Somerset.

Spot-Welding Torch

THE SW.300 argonarc spot-welding torch enables joints to be made when access to only one side of the work is possible. It can be used with one hand by semi-skilled labour.

The prototype has been developed from a previous design which necessitated access from both sides. It is claimed that shear values obtained compare favourably with those from resistance welding. Semi-automatic welding operations are preset. The torch is water cooled and can carry currents up to 300 A. The illustration shows the SW.300 in use for fabrication work in aluminium, an application which should make it useful for several aspects of rolling stock and building construction.

Further details may be obtained from the British Oxygen Co. Ltd., Bridgewater House, St. James's, London, S.W.1.

Vee-Rope Drives

ULTIVEE rope drives, compared with orthodox drives, are claimed to be capable of transmitting more power in less space, with a reduction of as much as 40 per cent in the number of ropes needed.

The weight of the complete drive is reduced because smaller pulley diameters and face-widths and shorter centre distances are used. Improved mechanical properties, obtained by the use of man-made fibres, have made possible this increase in power capacity. Only three sections of rope are used; these are available in a large range of lengths. Sizes are: 3CNV, ⅜ in. top x $\frac{7}{16}$ in. deep; 5CNV, ⅝ in. x $\frac{17}{32}$ in.; 8CNV, 1 in. x ⅞ in. The manufacturer states that the two smaller sections cover the majority of industrial requirements.

A standardised range of pulleys is available. These may be either taper bored for Crofts Taper-Flush bushes, or parallel bored with keyway. All Ultivee ropes have full heat- and oil-resistant qualities. These transmissions are being manufactured as an addition to the existing range.

Further details may be obtained from Crofts (Engineers) Limited, Bradford, 3.

Ministry of Transport Accident Report

Near Settle, January 21, 1960: British Railways, London Midland Region

Brigadier C. A. Langley, Chief Inspecting Officer of Railways, Ministry of Transport, inquired into the accident which occurred at about 1.48 a.m. on January 21, 1960, near Settle on the former Midland Railway route from Leeds to Carlisle, now part of the London Midland Region, British Railways.

The driver of the 9.5 p.m. up eight-coach express, drawn by a "Britannia" class 4–6–2 locomotive, had stopped his train at Garsdale, 20 miles from the scene of the accident, to examine his engine which had developed a serious knock. As he could find nothing wrong, he decided to continue at reduced speed to Hellifield, five miles on the London side of Settle, where there was a locomotive depot. The knocking continued, and while the express was approaching Settle at about 45 m.p.h., part of the right-hand motion assembly came adrift. On seeing this the driver made a full brake application, but the motion assembly, consisting of the piston rod, cross-head and connecting rod still attached to the driving wheel, was driven deep into the formation and overturned into the trailing position. The cross-head then struck the opposite line and damaged it to such an extent that the 10.40 p.m. down "H" class freight train from Leeds to Carlisle, then approaching at 25 m.p.h., was derailed towards the six-foot way. The front of the freight engine tore out the sides of the first three coaches of the express, broke windows, and scored the sides of the other five vehicles. Examination of the express engine showed that the two bottom right-hand slide bars had fallen off thus allowing the piston rod, cross-head, and connecting rod to come adrift. Five of the 75 passengers in the express lost their lives and eight, besides the guard of the freight train, were injured. Emergency measures were taken promptly. Despite the inclement weather the first ambulance arrived at 2.5 a.m., and the first doctor 5 min. later. All the injured were on their way to Skipton Hospital by 2.45 a.m. Other passengers were taken by ambulance to Settle Station at 4 a.m., and left by a relief train at 5.19 a.m. Both lines were repaired and restored to traffic at 4.15 p.m. after a stoppage of 14¼ hr.

It was a dark night and a blizzard with gale-force winds was sweeping the area; snow covered the formation to a depth of several inches. Garsdale, where the train was stopped, is on top of the moors, in an exposed and remote situation. From there to the scene of the accident the line first runs on the level for 6½ miles, and then descends on a ruling gradient of 1 in 100.

Condition of Express Engine

The "Britannia" locomotive has outside cylinders; the cross-head guide slides between the slide bars and produces an upward thrust of 3·84 tons on the top bar when the engine is starting with full steam pressure in the fore gear. The downward thrust on the two bottom bars when coasting at 90 m.p.h. is 1·82 tons. This drops to 0·62 tons at 45 m.p.h., and to 0·4 tons at 30 m.p.h.

The top slide bar is held to the frame by bolts through a substantial central bracket. The ends are free. The two bottom slide bars are fixed to the top bar by 1¼-in. dia. steel bolts which pass through bronze packing pieces 2½ in. wide by 1¼ in. deep. The bolts are inserted from the bottom and held by plain nuts with Whitworth threads. A ¼-in. dia. steel feather is inserted in a hole underneath the head of the bolt and this fits into a slot in the bolt hole to prevent the bolt from turning when it is tightened. A round steel split pin of ¼-in. dia. is used to hold the nut in position after it has been tightened.

The rear bolts can be tightened without difficulty, but the lagging of the steam chest directly above the top bar makes it difficult to tighten the front bolts, particularly the inner one for which a thin spanner must be used. It is also difficult to insert the split pin and to ensure that it is bearing hard against the top of the nut.

The records showed that these slide bar bolts had been giving constant trouble. Since the last heavy repair on September 26, 1959, these bolts had been reported loose nine times. A search along the track, from Carlisle to the scene of the accident showed that one nut and bolt—almost certainly the front inside bolt—had dropped off some 14 miles short of Garsdale, where the driver stopped, and from there onwards to Garsdale other bits were found, including both bottom slide bars and both packing pieces. The bolts and nuts picked up showed various signs of wear and play.

Examinations by Fitters

Fitters who had examined the engine at Leeds and Glasgow during the preceding few days generally confirmed that the bolts were inclined to work loose. This was particularly true of the front bolts. A Leeds examining fitter, who examined the engine on its arrival on the night of January 19/20, explained that these bolts were difficult to reach on account of the cylinder lagging, and added that a thin spanner had to be used to tighten the inner one, which was not satisfactory. He agreed that the first bolt to be picked up had been working in the hole and should have been renewed. A Leeds fitter who attended to the engine on the morning of January 20 said that the inside front bolt was loose and the bottom slide bar had dropped $\frac{1}{64}$ in. He tightened the bolt, moving the nut about one-third of a turn. He did not renew the split pin and agreed that as he had tightened the nut by $\frac{1}{64}$ in. the split pin could no longer be bearing against the head of the nut.

When the engine was examined at Glasgow on the evening of January 20, no faults to report were found.

Evidence of Driver

The driver of the express, in describing his run from Glasgow, noticed nothing untoward until after passing Aisgill, at the top of the long climb from Carlisle, at about 1.10 a.m. Then, on notching up the reversing lever, he noticed a knock, which he thought came from a big end. He shut the regulator and reduced speed, but the knocking got worse, so he opened the regulator slightly and kept the speed down by applying the brake. He stopped at Garsdale, and examined the bearings with the aid of a small electric hand torch. It was very dark, the wind was blowing at gale force, and it was snowing. He could see very little, but he felt all the bearings, particularly the big ends, where he thought the trouble lay. He examined the right-hand motion twice, because he had come to think that the trouble was on that side. He could find nothing wrong. The bearings were cool and he could not see anything missing.

He then decided to proceed at slow speed to Hellifield. He said that he travelled slowly, keeping the regulator slightly open and applying the brake whenever speed increased. At first he said his speed never exceeded 20 m.p.h., and that he checked it by his speedometer. When told that the signal box timings showed that his average speed from Garsdale onwards was 42 m.p.h. and also that he had been running down a long falling gradient with the regulator partly open, he agreed that the speed could have been well over 30 m.p.h. though he had not noticed it.

After passing Settle distant signal he and his fireman noticed sparks flying from the right-hand side of the engine and ballast was being thrown up against the cab. He immediately made a full brake application and as he passed the freight train he felt his engine shuddering. He did not recall any violent jolt before this. After the accident he found the connecting rod in the trailing position with the piston rod and crosshead still attached and lying on the ballast.

Condition of Track

Both tracks are laid with 109-lb. flat-bottom rails resting on cast-iron base-plates held by elastic spikes to wooden sleepers. The spikes are placed two on the inside and one on the outside of the rail. Examination of the track first revealed marks and displacement of ballast, culminating in a hole at least 2 ft. deep. This it was inferred was where the connecting rod "somersaulted" into the trailing position, and Brigadier Langley comments that it was remarkable that the engine was not derailed there and then.

From that point onwards it seems clear that the connecting rod continued to thrash about. Brigadier Langley believes that as the freight engine was about to pass the express, the cross-head caught some of the down line sleepers, dislodged or broke the outside spikes, and pulled the right-hand rail of the down line in a kink outwards. The freight engine was working heavily up the gradient with its right-hand wheels bearing hard against this rail. On reaching the kink the leading pony wheels dropped off onto the bottom flange of the rail and burst open the track. The right-hand engine wheels and those of the next six vehicles passed through the resulting gap into the 6 ft. space without mounting any of the rails.

Brigadier Langley states that owing to insufficient attention having been paid to the tightening of the front slide bar bolts—which were not easy to reach and were difficult to tighten—the express train's Britannia engine left Glasgow in a potentially dangerous condition. He added, however, that he did not propose to make particular reference to the individual staff concerned.

In view of the severe weather, Brigadier Langley points out, it is understandable that on examining the engine at Garsdale, the driver failed to notice the loss of the slide bars—the more so as he was looking chiefly for a hot bearing, which is a usual cause of knocking in locomotives. In view of the circumstances the driver is not criticised for this failure. It was also reasonable for him to decide to take his train on to Hellifield.

On the other hand it should have been clear to the driver that something was seriously wrong, and he should have travelled very much slower than the evidence suggests he did. He did not seem to appreciate how quickly a powerful engine can gain speed with a light load on a falling gradient, and Brigadier Langley believes that in his anxiety to reduce the knocking by keeping the regulator open the driver failed

to check his engine sufficiently with the brake. Nor could he have paid much attention to his speedometer. He must, therefore, bear some measure of responsibility for the accident.

As Brigadier Langley points out, loose slide bar bolts had been a frequent occurrence on this Britannia engine—on no less than 10 occasions, in under four months, these bolts had been reported loose. This type of defect had not been confined to this particular engine, but had been common to those of this class. In addition slide bars had been displaced or had fallen off on four occasions. After the second of these four last occasions the difficulty of access to these bolts was recognised, and a new design was prepared for the front fastening whereby the units were placed underneath, instead of on top, and the round split pins were replaced by substantial split cotters. On March 11, 1959, all Regions of British Railways were advised of this change, and on August 28, 1959, following the fourth failure, orders were issued in the London Midland Region that this alteration must be made whenever "Britannia" class engines came in for periodical overhaul. Only four had been so modified at the time of the accident, but since then, and up to the time of Brigadier Langley's report, all 55 engines of the "Britannia" class and 10 engines of Class "6" have so been modified. The same order has been given for Class 5 and Class 9 engines. Brigadier Langley calls attention to the need for substantial and properly tightened fastenings, which should be properly accessible, and emphasises the need for this in the future design of both diesel and electric locomotives. He adds that difficulty in reaching such parts can give rise to slack maintenance as has been exemplified by this accident. His investigation showed that the standard of maintenance of the motion of Britannia locomotives had not been satisfactory in a number of depots. He recommends that the facts of this accident should be brought to the notice of all the Motive Power maintenance staff concerned.

Finally, he calls attention to the commendable way in which all the emergency services, both railway and local, came into action in the early hours of the morning, despite the adverse conditions. The train crew took prompt action, and the Settle signalman lost no time. Despite snow-covered roads and a raging blizzard, response by rescue workers of all kinds was most prompt and effective. These excellent arrangements reflect the greatest credit on all concerned, and also on the close liaison which must have existed between the railway and the local authorities.

Reconstruction of Reading General Station

Plans for the rebuilding of Reading General Station, Western Region, British Railways, include improvements to the track layout and modernisation of signalling. Work is expected to begin early in 1961, and the total cost will be about £2,500,000.

The new station buildings, which will be concrete-framed, will accommodate, on ground level, a booking hall, booking office, refreshment rooms, parcels office, and staff accommodation. A two-storey block is to be built above the refreshment rooms, which will contain a kitchen and staff rooms on the first floor and a staff hostel on the second. During reconstruction, temporary offices and accommodation will be provided adjacent to Vincent's Garage site.

Down Through Line

The scheme provides for a new down main platform line which will make it practicable for a through express to pass a train occupying the platform ; this at present is possible only in the up direction.

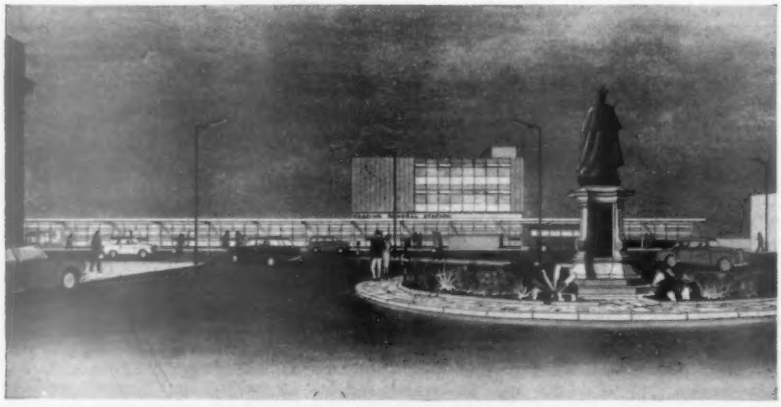
The new down line will ease a serious difficulty, particularly during the evening peak traffic hours, when the down main line, which governs to a considerable extent the capacity of the line, is heavily occupied with express passenger, parcels, and goods trains.

Construction of the new line will involve the setting back of the platform edge and adapting the existing track as a through line.

Demolition of the existing station buildings will be involved and the new premises will be rebuilt nearer the approach road.

Electric colour and light signalling is to be installed. An automatic central signalbox will control signals and points from Cholsey, on the main line from Didcot, Midgham, on the Westbury main line, and Bramley, on the Basingstoke line, to a point five miles east of Twyford on the main line to London. Placing in service of the new box will enable 15 existing boxes to be closed.

The plans were developed by the late Mr. H. E. B. Cavanagh, Regional Architect, under the direction of Mr. M. G. R. Smith, Chief Civil Engineer, and Mr. A. A. A. Cardani, Signal Engineer, Western Region, British Railways.



Artist's impression of south frontage of Reading General Station, Western Region

Institution of Railway Signal Engineers

The annual technical visit of the Institution of Railway Signal Engineers was paid on October 15 to London Transport Executive signalling installations in the Earls Court area, Parsons Green, and Upminster. The Earls Court–Putney Bridge section is being modernised and junction and point operation has been arranged to be automatically effected by programme machines.

The party was led by Mr. W. Owen, President, and was welcomed by Mr. R. Dell, Signal Engineer, L.T.E. and Past President.

The morning inspection included the new control room at Earls Court, opened on October 8, the control room at Cromwell Road, the interlocking machine rooms at South Kensington and Gloucester Road and the installation at Parsons Green comprising a new interlocking machine and relay room, programme machines, and siding allocations panel in the yardmaster's office.

Installations at Upminster

The party then left for Upminster by special train from South Kensington. On arrival the shunter's control tower and relay room in the depot were inspected, also the push-button control frame, interlocking machine and relay room at Upminster Station. The Chief Mechanical Engineer's depot was also visited. Two items available for inspection were an electro-pneumatic point layout, of the chairlock pattern, and a signal location complete with signal prewired in the signal shops.

U.I.C. Board of Management

The 55th session of the Board of Management of the International Union of Railways (U.I.C.) was held in Paris on September 19 under the chairmanship of Professor H. M. Oeftering, Senior Chairman of the German Federal Railway.

The United Kingdom was represented by Mr. John Ratter, Member, British Transport Commission, and by Mr. G. M. Leach, International Traffic Officer, British Transport Commission.

The agenda included the following items:—

Work of the Committees:

It was decided that study be made of the amendments necessary in the new U.I.C. Code leaflet on standard marking of wagons, so that use could be made of electronic data processing equipment.

The Board of Management decided that studies on the T.E.E.M. through goods train network should be entrusted to a special working party within the European Goods Trains Timetable Conference (L.I.M.). Some T.E.E.M. trains will be run as from the 1961-62 timetable.

General Study of Railway Problems :

It was decided that the U.I.C. should participate in the general survey of the economic problems arising from the present situation in the majority of railways, which had been undertaken by the European Conference of Ministers of Transport.

The Board also dealt with relations between the U.I.C. and the International Labour Office, and the conditions in which the U.I.C. member administrations could be asked to assist in answering requests for information from railways which did not have the necessary research facilities.

Contracts and Tenders

Electrical equipment for British Railways multiple-unit a.c. trains

The British Transport Commission has placed an order with the General Electric Co. Ltd. for electrical equipment for 23 high-speed a.c. multiple-unit trains to the value of £580,000. The trains will go into service in the Eastern Region of British Railways between Liverpool Street, Clacton and Walton. Fifteen will be four-car and eight two-car units. They will have a maximum speed of 90 m.p.h. The order is the first placed in this country for motor-coach equipment to work at this speed.

A further contract has been signed in Buenos Aires between the Argentine State Railways and the Tokio Shibaura Electric Co. Ltd. for the supply of 150 electric coaches for the suburban lines of the Sarmiento Railway, together with spare parts. They will be similar to those already in service but with a number of improvements such as better ventilation. Of this total, 120 will be motor coaches and 30 baggage and mail cars. Delivery will begin with 10 coaches in August, 1961, 10 in September, and 20 each succeeding month until the contract is fulfilled. The value of the contact is $16,000,000. It will be financed directly by the State as it forms part of the emergency recuperation plan. It is proposed to transfer later several of the coaches at present in use to the General Mitre Railway, after complete overhaul and adaptation to the different platform heights.

The Crown Agents has placed an order with Wegmann & Company, Kassel, Western Germany, for 33 coaching-stock vehicles for the Ghana Railways. The order comprises 19 composite first and second class passenger coaches, two inspection coaches and 19 drivers caboose coaches. Wegmann & Company has also received an order from Jugoslav Railways for a twin-car diesel-hydraulic saloon train for special services. Two engines of 325/350 h.p. are to be fitted, and drive is to be through Voith T.33 transmission.

British Railways, Western Region, has placed an order with Heenan & Froude Limited for a complete railcar engine test plant to be installed at Swindon. Editorial reference is made to this contract on page 466. The plant will include universal engine mounting stands, cardan shafts, control desks, and water cooling and exhaust systems.

An order for 50 steel flat wagons for use on Canadian National Railways lines in Newfoundland has been placed with the Eastern Car Division of Dominion Steel & Coal Corporation in Trenton, Nova Scotia. The wagons supplement an order of 80 wagons placed with Dominion Steel & Coal Corporation last July. The 40-ton flat wagons 40 ft. long, are similar in weight to wagons now in service in the province, but have an increased capacity of 35 per cent because of the use of low-alloy steel instead of structural carbon.

British Railways, Scottish Region, has placed the following contracts:—

James Miller & Partners Ltd.: reconstruction of overbridge No. 35, Uddingston

John Grant & Son (Decorators) Ltd.: painting and maintenance work, Perth Station

Ellis & McDougall: two goods lifts, Perth Station

Concrete (Scotland) Limited: pre-cast concrete units for nine bridges

Alexander Hall & Son (Builders) Ltd.: two four-apartment cottages for permanent way staff, Achanalt, Ross and Cromarty

Scottish Construction Co. Ltd.: pre-cast concrete units and pre-stressed concrete beams for five bridges.

British Railways, London Midland Region, has placed the following contracts:

Vic. Hallam (Contractors) Limited: construction of diesel training school at motive power depot, Derby

Wellerman Bros. Ltd.: aerocem pressure pointing and grouting at Corby Tunnel on Kettering—Nottingham line

J. H. Fryer Limited: construction of engine balancing tables building at the locomotive works, Derby

Holland & Hannen and Cubitts (Great Britain) Limited: accommodation for Chief Civil Engineer's Department at 67/87 Hampstead Road, London, N.W.1

Edward Wood & Sons Ltd.: road motor repair shed and petrol installation at new freight terminal, Stoke-on-Trent

Carmichael Edwards & Co. Ltd.: cleaning and painting of bridges on the Chester—Holyhead line and Derby North district

Industrial Engineering Limited: main roof repairs and renewal of roof glazing at Manchester Central Station.

Siemens & Halske A.G., of Brunswick, has received from the Belgian National Railways an order for nine sets of electronically controlled retarders, each with the new S. & H. form of automatic weight-recording device. Five of these equipments are for the new marshalling yard at Kinkempois (Liège) and four are for the yard at Monceau. This equipment is to be of the latest design with oil-hydraulic drive and very short reaction times.

The Export Services Branch, Board of Trade, has received calls for tenders as follow :—

From Victoria :

100 neutral line relay, four-way with four dependent front and back contacts, as specified

100 neutral track relay, four-way with four dependent front and back contacts as specified

25 neutral track relay, six-way with four dependent front and back and two independent front contacts as specified.

The issuing authority is the Secretary, Victorian Railways, Spencer Street, Melbourne, C.1, to whom bids should be sent. The tender No. is 61804. The closing date is November 2, 1960. The Board of Trade reference is ESB/26934/60.

100 switch circuit controllers.

The issuing authority is the Secretary, Victorian Railways, Spencer Street, Melbourne C.1, to whom bids should be sent. The tender No. is 61805. The closing date is November 2, 1960. The Board of Trade reference is ESB/26935/60.

From Queensland :

Construction of the substructure and superstructure of a railway bridge as well as the approaches and track. The proposed bridge, located on the Western Line of the Northern Division of the Queensland Government Railways approximately 70 miles west of Townsville, consists of 12 70-ft. through plate girder spans and six 250-ft. truss spans.

The issuing authority is the Queensland Government Railways. Contract documents, comprising form of tender, conditions of tendering, agreement, general conditions, special conditions, specifications and drawings, may be obtained by prospective tenderers on written request to : Ford, Bacon & Davis, Inc., Box 443F, G.P.O., Brisbane, Queensland, Australia. Requests for contract documents must be accompanied by a cheque for £A15 for each set requested. An additional charge for oversea air mail postage will be made at cost. Payment for contract documents is not refundable. A preliminary deposit in the amount of £A5,000 shall be enclosed with the Tender. Tenders for the contract must be submitted in duplicate, and shall be enclosed in a sealed envelope endorsed with the contract number and name of the work and addressed to, the Secretary, the Commissioner for Railways, Railways Building, Adelaide Street, Brisbane. The tender No. is 4. The closing date is December 19, 1960. The Board of Trade reference is ESB/27171/60. No further information is available at the Board of Trade.

From Rhodesia :

2,750,000 coach screws Type "D" 6½ in. long, ⅞ in. dia.

930,000 rolled steel Type "C" soleplates

Alternatively :

930,000 rolled steel Type "D" soleplates

1,550,000 rail clips Type "C"

Alternatively :

3,450,000 rail clips Type "C"

1,900,000 rail clips Type "D."

The issuing authority is the Chief Engineer, Rhodesia Railways, P.O. Box 604, Bulawayo, S. Rhodesia from whom tender documents may be obtained on payment of £5 5s. Reference and details of contracts already undertaken must be supplied by the tenderers who have not previously carried out contracts for the Rhodesia Railways. The documents are not transferable and will only be accepted from tenderers to whom they were originally issued. The deposit will be returned on receipt of a bona fide tender. Bids should be sent to the Secretary, Tender Board, P.O. Box 1577, Bulawayo, S. Rhodesia. The closing date is November 28, 1960. The Board of Trade reference is ESB/26978/60.

From Thailand:

200,000 track spikes, for 50-lb. rail, of best quality mild steel, made by the open hearth or Bessemer process.

The issuing authority is the State Railways of Thailand. Drawings are available at a cost of Bht. 20 per set. The closing date is November 7, 1960. The Board of Trade reference is ESB/26667/60.

From Iraq:

6 items of metre- and standard-gauge turnouts comprising a total of 250 sets.

The issuing authority is the Directorate General, Iraqi Republican Railways, Baghdad West, Iraq, to whom bids should be sent. The tender No. is IRRS/R/4/60. The closing date is December 10, 1960. The Board of Trade reference is ESB/26462/60.

From Sudan:

18 main-line diesel locomotives of 120 h.p.

The issuing authority is the Assistant General Manager (Supplies), the Sudan

Gezira Board, Barakat, Sudan, to whom bids should be sent. The tender No. is 9. The closing date is November 12, 1960. The Board of Trade reference is ESB/26655/60.

14 diesel shunting locomotives.
The issuing authority is the Assistant General Manager (Supplies), the Sudan Gezira Board, Barakat, Sudan, to whom bids should be sent. The tender No. is 7. The closing date is November 12, 1960. The Board of Trade reference is ESB/26657/60.

16 main-line diesel locomotives of 80 h.p.
The issuing authority is the Assistant General Manager (Supplies), the Sudan Gezira Board, Barakat, Sudan, to whom bids should be sent. The tender No. is 10. The closing date is November 12, 1960. The B.O.T. reference is ESB/26656/60.

From Uruguay :
Reconstruction or construction of a bridge over the Rio Salsipuedes on the Paso de los Toros-Salto main line. The existing bridge of 12 20-metre spans and two 38-metre spans is now considered by the railway authorities to be of too antiquated a design and structure to support modern requirements. Tenderers are invited to submit offers for any of the three following projects:

(1) A steel superstructure to be erected on the existing 13 double piers.

(2) A concrete superstructure on the existing piers.

(3) A new concrete bridge to be erected alongside the site of the present bridge.

In alternatives (1) and (2) modification to the number and length of spans is allowed. Tenders submitting a project for alternative (1) should quote two estimates: (*a*) corresponding to the cost of materials delivered on wagon in the Port of Montevideo, and (*b*) for the supply of materials and the erection of the superstructure. It would be necessary for a United Kingdom firm specialising in bridge design and building to join with a Uruguayan firm of engineers to carry out the work on site under their supervision.

The issuing authority is the Uruguayan State Railway (A.F.E.). Bids should be sent to Seccion Licitaciones de la Gerencia General de la Administracion de Ferrocarriles del Estado, Calle La Paz No. 1095, Montevideo, The tender No. is 589/60. The closing date is December 15, 1960. The Board of Trade reference for this enquiry is ESB/26458/60.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road, W.C.1).

Notes and News

British Railways Electrification Conference.—The observations attributed to Mr. L. M. Sayers, British Railways (October 8 issue of the Daily Bulletin of British Railways Electrification Conference), were in fact made by Mr. D. P. Sayers, Chief Commercial Officer, Central Electricity Generating Board.

South African Economics Minister at Henschel Anniversary.—The South African Minister of Economic Affairs, Dr. N. Diederichs, on October 15 inspected the Henschel Werke G.m.b.H plant at Kassel, and attended part of the firm's 150th anniversary celebrations. The main purpose of his visit to Western Germany was discussion of the possibilities of increasing trade between that country and South Africa.

Diesel Engineers & Users' Association Annual General Meeting.—At the annual general meeting of the Diesel Engineers & Users' Association at The Institute of Marine Engineers, London, E.C.3, on October 20, the officers for 1960-61 were elected, and the Still Medal for 1960 was presented to Mr. P. J. C. Teece for his paper entitled, "Foundations & Mountings for Diesel Engines." After the conclusion of the business of the annual general meeting a paper entitled, "Latent Heat Cooling and Waste Heat Recovery," was presented to the meeting by Mr. R. Brett-Littlechild.

British Transport Advertising Reception at Manchester.—Advertisers and agents in the North-West were guests of British Transport Advertising at a reception held recently in the Midland Hotel, Manchester, to introduce their new Area Sales Manager, Mr. W. R. Peacock. The gathering saw the British Transport Commission filmstrip, "Let's Look at British Transport Advertising." The illustration shows (left to right) : Messrs. W. J. Oliver, Sales Officer, British Transport Advertising ; J. H. Saunders, Manager, Odeon Cinema, Manchester ; W. R. Peacock, Area Sales Manager, British Transport Advertising, Manchester ; E. T. Neville, Publicity Manager, Thomson's Newspapers Limited ; and T. Stopford, Executive, Roe Outdoor Advertising. Similar entertainment also was offered by British Transport Advertising to advertisers and agents in the Liverpool area in the Adelphi Hotel, Liverpool; those present included Messrs. W. A. Gregson, Managing Director, Garlick Burrell & Edwards Limited; L. Caddick, Advertising Manager, Crosfields & Calthrop Limited; S. Barrell, Managing Director, Thomas Whitney & Co. Ltd.; H. Stansfield, Managing Director, Douglass & Company; and S. Broadbent, British Transport Advertising Representative in Liverpool.

At the reception by British Transport Advertising at Manchester of advertisers and agents in the North-West

Diesel Train in Collision with Goods Wagons.—A multiple-unit diesel train travelling from Manchester to Buxton was in collision with a stationary goods train at New Mills Station, Derbyshire, British Railways, London Midland Region, on October 12. The motorman of the diesel train was seriously hurt and a boy and girl were also injured and taken to hospital. The leading coach of the four-car diesel train reared 20 ft. into the air before coming to rest with its front part on top of the brake van of the goods train. The second and third coaches were derailed.

Further Colour-Light Signalling and A.W.S. on East Coast Main Line.—Colour-light signalling has been brought into use on a five-mile section of the East Coast main-line between Burnmouth Signalbox, Scottish Region, and Marshall Meadows, Berwick, the most northerly signalbox in the North Eastern Region, British Railways. Twelve colour-light signals and 18 electrical track circuits have been provided. In addition, A.W.S. has been installed on this section and extended through adjacent sections to form a continuous 73-mile stretch from Edinburgh Waverley to Belford.

International Conference on the Metallurgy of Beryllium.—The Institute of Metals is holding an international conference on the metallurgy of beryllium in London on October 16, 17, and 18, 1961. The intention is to discuss hitherto unpublished works on beryllium, and to cover metal fabrication, physical and mechanical properties, and metal physics: the whole field of the metallurgy of beryllium except for extraction processes. The conference will be organised by the Institute's Nuclear Energy Committee. The organising committee invites offers of original papers, and requests that titles and synopses be submitted by January 1, and manuscripts, in duplicate, by April 1. The Secretary should be advised as soon as possible of the topics. Papers will be issued in advance and will later be published, with reports of discussions, in bound form. Correspondence should be addressed to the Secretary, the Institute of Metals, 17, Belgrave Square, London, S.W.1.

Special Sleeping-Car Train for Catering Staff.—Catering arrangements made for the luncheon held recently at Rogerstone Works near Newport by Alcan Industries Limited, to which reference was made in last week's issue, included the provision by British Railways, Western Region, of a special sleeping-car train to convey 80 members of the staff of J. Lyons & Co. Ltd. from London. The train left Paddington at 11.20 p.m. on October 5 and was berthed in a siding at a country station outside Newport on arrival there at 3 a.m. on October 6. It left at

6.40 a.m. for Newport where the catering staff boarded road-motor buses for the final three-mile journey to Rogerstone.

Nalder Bros. & Thompson Limited Presentation to Managing Director.—On the occasion of the sixty-first anniversary of Nalder Bros. & Thompson Limited on October 15 a presentation was made to Mr. Semmens, the Managing Director, in recognition of his 50 years of service with the company.

B.T.C. Harbour Charges Schemes Confirmed.—The Transport Tribunal on September 29 confirmed the British Transport Commission Charges Schemes for Fleetwood, Grimsby, Hull, and Lowestoft Harbours, which lay down maximum ship, merchandise, and (except in the case of Lowestoft) passenger dues.

Exhibition Tour by Railway Coach.—Mr. James Fox, Provost of Motherwell, on October 14 officially despatched an exhibition railway coach which is displaying Scottish goods over the Border. Later, it is to tour Scottish centres, starting at Stirling on October 31. Altogether 85 stations will be visited; the tour began at Carlisle on October 17. The object is to display goods to customers near their own premises. The exhibits cover a wide range of sporting gear, including fishing rods and tackle, sports guns, and camping equipment.

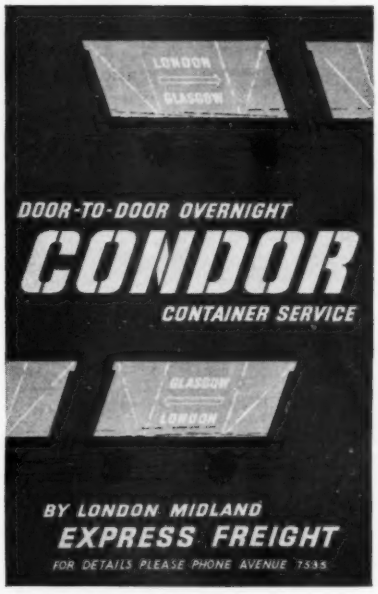
Vokes Limited Change of Name and New Company.—Vokes Limited has changed its name to Vokes Group Limited, and a new subsidiary company, Vokes Limited, has been incorporated to take over the business and trading of the former Vokes Limited. The board of Vokes Group Limited remains as before and the Directors are: Sir Ian Stewart-Richardson, Bt., Chairman; Mr. C. E. M. Hardie, Vice-Chairman; Mr. H. F. Osborne, Managing Director; Messrs. C. G. Vokes, J. Fearn, and J. Phillips, who is also Secretary. The board of the new operating subsidiary is: Sir Ian Stewart-Richardson, Bt., Chairman; Mr. H. F. Osborne, Vice-Chairman & Managing Director; Messrs. C. E. M. Hardie, D. F. Ringe, General Manager; J. Phillips, Secretary; and A. E. Queening, Assistant Secretary.

Wickman & Co. Ltd. Agents for the Gardner-Denver Company Products.—Wickman & Co. Ltd. have announced that the sole agency in the United Kingdom for the range of mining and construction equipment built by the Gardner-Denver Company, Illinois, U.S.A., has now been assumed by the Wickman Mining Division, Nuneaton.

Publicising the "Condor" Container Service. The poster illustrated has been produced by the London Midland Region, British Railways. It directs the attention of traders in the London area to the "Condor" container service operated in conjunction with the Scottish Region between Hendon, the London, and Gushetfaulds, the Glasgow railheads, affording overnight door-to-door service.

Foster Bros. (London) Ltd. Change of Address.—Foster Bros. (London) Ltd. have transferred to new office and warehouse premises at Windsor Works, Venn Street, London, S.W.4. Imminent changes in the organisation of the firm are the retirement of Mr. A. T. Ayers from the board, and the appointment in his place of Mr. J. S. D. Ayers. Mr. J. H. Watson has joined the sales department of the firm.

Rail Link between Turkey and Persia.—Work is reported to be progressing on the railway between Turkey and Persia, and 120 miles remain to be completed. The U.S.A. Government has given $2,000,000 to Persia for building the line in Persian territory, and the Development Loan Fund gave $6,000,000 to Turkey. The Fund authority has now decided that construction of the railway is not an economic proposition.



London Midland Region poster featuring the "Condor" London-Glasgow overnight container service

British Electric Traction Co. Ltd. Prize Award.—The annual prize awarded by the British Electric Traction Co. Ltd. to the candidate who, being an employee of a road passenger transport company, achieves the highest aggregate of marks in the Royal Society of Arts examinations for a diploma in Road Transport Subjects, has been won for 1959-60 by Mr. Kenneth L. Stones, an engineering inspector with the Birmingham & Midland Motor Omnibus Co. Ltd.

Production-Engineering Limited Paris Organisation.—To develop trading opportunities with the European Common Market and to encourage closer exchange of industrial and management practices between Britain and Europe, Production-Engineering Limited has recently founded a new organisation in Paris. It is called Production-Engineering Société Anonyme, and is a member of the PE Group of companies. The President-Directeur of P.E.S.A. is Mr. R. A. Crompton-Roberts. Other Directors include Mr. D. L. Nicolson, Managing Director of Production-Engineering Limited, Mr. A. F. Frodsham, Assistant Managing Director of the company, and M. Lucian-Jean Levy, a French marine and railway engineer. A booklet entitled "Into Europe: A Brief Survey of Opportunities in the Common Market", is referred to in our Publications Received columns.

Hull Central Goods Depot to be Opened.—Hull Central Goods Depot, British Railways, North Eastern Region, the new freight concentration centre in Hull, is to be opened today (Friday) by Major J. B. Upton, High Sheriff of Yorkshire and Senior Vice-President of the Hull Incorporated Chamber of Commerce & Shipping. He will be accompanied by Mr. T. H. Summerson, Member of the British Transport Commission and Chairman of the North Eastern Area Board; Mr. H. A. Short, General Manager, British Railways, North Eastern Region; and by senior Regional and local railway officers. The Lord Mayor of Hull, Alderman W. E. Body, and the Sheriff, Mr. T. Farrell, and

London Midland Region Publicity

A recent poster produced by the Public Relations & Publicity Department, British Railways, London Midland Region, showing a Bo-Bo locomotive on the Crewe-Manchester line, electrified at 25 kV.

leading personalities in the industrial, and commercial worlds, also will be present. The opening is to be the occasion of a display of new equipment and other features of the modernisation of British Railways. A prototype of the Roadrailer vehicle, described in our September 9 issue, will be exhibited, and a demonstration of its use and transfer between rail and road will be given after the ceremony. Also shown will be photographs of other important modernisation features in the Hull area, notably the diesel multiple-unit depot at Botanic Gardens, completed last year, and an artist's impression of the offices under construction at Paragon Station.

Conversion of Former M.G.N. Line into Road.—In furtherance of its plans to use the former Midland & Great Northern Railway line for roads to provide a better route to the Norfolk coast and Broads from the Midlands, Norfolk County Council has decided to buy five stretches of line and to negotiate with the British Transport Commission for the acquisition of five other stretches. For these fresh lengths of line the B.T.C. has quoted a price which exceeds that estimated by the County Surveyor. One council does not agree with the reasons put forward by the Commission for this price, and has asked the district valuer to pursue negotiations. In the case of the first five stretches of line the Minister of Transport has agreed to provide grants towards the cost of conversion; for the second five lengths he can offer no such help.

Forthcoming Meetings

October 22 (*Sat.*).—Railway Students' Association, visit to Southern Region Kent Coast Electrified Area. Special train leaves Charing Cross at 9.10 a.m.

October 22 (*Sat.*).—Railway Correspondence & Travel Society, South of England Branch at the Palmer Hall, West Street, Reading, at 6 p.m. "S.E.C.R. Footplate Experiences," Mr. B. Pope.

October 22 (*Sat.*).—The Permanent Way Institution, East Anglia Section, at Norwich, at 2.15 p.m. "Canadian Railways"—a film show.

October 22 (*Sat.*).—Railway Correspondence & Travel Society, Bristol Branch, at Grosvenor Hotel, Bristol 1, at 7.15 p.m. "Irish Railways" (illustrated)—Mr. K. Adams.

October 24 (*Mon.*).—Railway Correspondence & Travel Society, Northampton Branch, at the Liberal Club, Castilian Street, Northampton, at 7.30 p.m. "A Trip to Ireland," Mr. H. C. Casserley.

October 24 (*Mon.*).—The Permanent Way Institution, London Section, at Headquarters of British Transport Commission, Marylebone Road, London, N.W.1, at 6.30 p.m. "Preservation of Timber"—Mr. W. Rothwell.

October 25 (*Tue.*).—Retired Railway Officers' Society Annual Autumn Luncheon, at Hotel Russell, Russell Square, London, W.C.1.

October 25-27 (*Tue.*).—Institution of Locomotive Engineers, meeting at Barrow-in-Furness. Assembly of members at Old England Hotel, Bowness-on-Windermere, 7.30 p.m., October 25.

October 26 (*Wed.*).—Institute of Traffic Administration, Devon & Cornwall Branch, at S.W. Gas Board Theatre, Plymouth, at 7.15 p.m. "Passenger Transport"—Mr. A. W. Kirkwood.

October 26 (*Wed.*).—The Institution of Mechanical Engineers, at 1, Birdcage Walk, London, S.W.1, at 6 p.m. "The Scientist's Contribution to Mechanical Engineering," Professor Owen A. Saunders.

October 27 (*Thu.*).—The Permanent Way Institution, Notts. & Derby Section, at Victoria Station Hotel, Nottingham, at 6.30 p.m. "Continuous Welded Rails"—Mr. E. Labrum.

October 29 (*Sat.*).—Railway Correspondence & Travel Society, Sussex & Kent Branch, at the Railway Hotel, Brighton, at 7 p.m. "The Main Line of the L.B.S.C.R.," Mr. O. J. Morris.

October 31 (*Mon.*).—The Institution of Mechanical Engineers, at 1 Birdcage Walk, London, S.W.1, at 6 p.m. "Rolling Bearing Problems—Is there a Need for Fundamental Research?"—Applied Mechanics and Lubrication Groups, Discussion.

November 1 (*Tue.*).—The Institution of Civil Engineers, at Great George Street, London, S.W.1, at 5.30 p.m. Presidential Address by Sir Herbert Manzoni.

November 1 (*Tue.*).—South Wales & Monmouthshire Railways & Docks Lecture & Debating Society, at the Angel Hotel, Cardiff, at 6.30 p.m. "The Future Place of Railways in British Transport," Mr. G. F. Fiennes.

November 1 (*Tue.*).—The Institute of Transport, at the Connaught Rooms, Great Queen Street, London, W.C.2, at 12.15 p.m. Anniversary Luncheon.

November 1 (*Tue.*).—The Institute of Traffic Administration, Bristol Branch, at the Grand Hotel, Bristol, at 7.30 p.m. "Traffic Licensing," Mr. T. D. Cooper.

November 1 (*Tue.*).—The Institute of Traffic Administration, Portsmouth & Southampton Branches joint meeting, at the Solent Hotel, Portsmouth, at 7 p.m.

November 1 (*Tue.*).—Railway Correspondence & Travel Society, Sheffield Branch, at Livesey—Clegg House, Union Street, Sheffield, at 7.30 p.m. "Lesser-known Branches in the North East," Mr. T. E. Rounthwaite.

Railway Stock Market

The more hopeful trend in stock markets has been followed by a reaction now that the Chancellor of the Exchequer, Mr. Selwyn Lloyd, has warned that an immediate easing of the credit squeeze cannot be expected. With the latest trade figures showing a further decline in exports, the view now seems to have gained ground that in the next few months the most that can be expected is a reduction in bank rate.

In foreign rails, Antofagasta reflected the prevailing trend in stock markets, the ordinary stock having declined from 13 a week ago to 12½, and the preference stock was fractionally easier at 32½xd. A strong feature, however, was an advance from 58½ to 61½ in Mexican Central "A" bearer debentures. Sao Paulo Railway 3s. units were again quoted at 1s. and United of Havana second income stock at 6.

International Railways of Central America shares were $28¼ and the preferred stock $111. Guayaquil & Quito assented bonds kept at 69½ and Chilean Northern first debentures were 55½, with Costa Rica ordinary stock 38½ and the first and second debentures 94½ and 110xd. respectively. Brazil Rail bonds remained at 5½. Paraguay Central prior debentures were 15. Salvador Railway consolidated stock was quoted at 4½ and the income loan stock at 12½.

Canadian Pacifics have reacted from $39½ a week ago to a new low for the year of $38½ at which there is a generous yield of 7 per cent. The preference stock was maintained at 61¼ and the 4 per cent debentures eased from 63¼ to 62⅞. White Pass shares remained at $10¾.

Nyasaland Railways shares were again 9s. and the 3½ per cent debentures 44½. West of India Portuguese capital stock was 110½ with the 5 per cent debentures 93. Barsi Light Railway ordinary stock was again quoted at 17½.

In line with the prevailing trend in markets the shares of locomotive building and engineering companies have moved lower, but in general declines were mostly not more than a few pence. Beyer Peacock eased from 7s. 10½d. to 7s. 7½d. and Charles Roberts 5s. shares reacted from 9s. 10½d. to 9s. 6d. Westinghouse eased on balance from 46s. to 45s. 9d. Birmingham Wagon have been steady at 33s. 9d. North British Locomotive were 9s. 3d. Wagon Repairs 5s. shares have been firm at 20s. 3d.

Elsewhere, Gloucester Wagon 10s. shares were 9s. 9d., though attention drawn in the City to the value of the group's assets suggests the shares are moderately priced. G. D. Peters, which remained firmly held, have changed hands at 14s. Pressed Steel 5s. shares after last week's rally, reacted to 27s. 3d. and Dowty Group 10s. shares were 37s.

Ransome & Marles 5s. ordinary shares held steady at 27s. in front of the dividend announcement. Pollard Bearing 4s. shares, after rising, receded to 51s. 3d. and in other directions, Vickers came back to 30s. 9d. at which there is a yield of 6½ per cent, but Stone-Platt at 60s. 3d. held all but a small part of their recent rise. British Oxygen eased to 31s. 3d., but Tube Investments were firmer at 88s. 9d. Broom & Wade 5s. shares were 21s. 10½d.

Associated Electrical dropped back with the surrounding trend and were 43s. 3d., their lowest this year. English Electric at 32s. 6d. were also at the lowest for the year, while General Electric declined to 34s. 6d. T. W. Ward came back to 76s. and G. & J. Weir 5s. shares eased slightly to 16s. 9d.

Renold Chain at 39s. 6d. and Ruston & Hornsby at 25s. 6d. also moved moderately lower compared with a week ago, as did Metal Industries at 60s. Steel shares also receded, with United Steel at 80s. 6d. and Dorman Long 41s. 3d.

OFFICIAL NOTICES

PUBLIC NOTICE

CUSTOMS REQUIREMENTS

TRAFFIC BETWEEN GREAT BRITAIN AND THE REPUBLIC OF IRELAND

(Merchandise and Live Stock by Goods and Passenger Services)

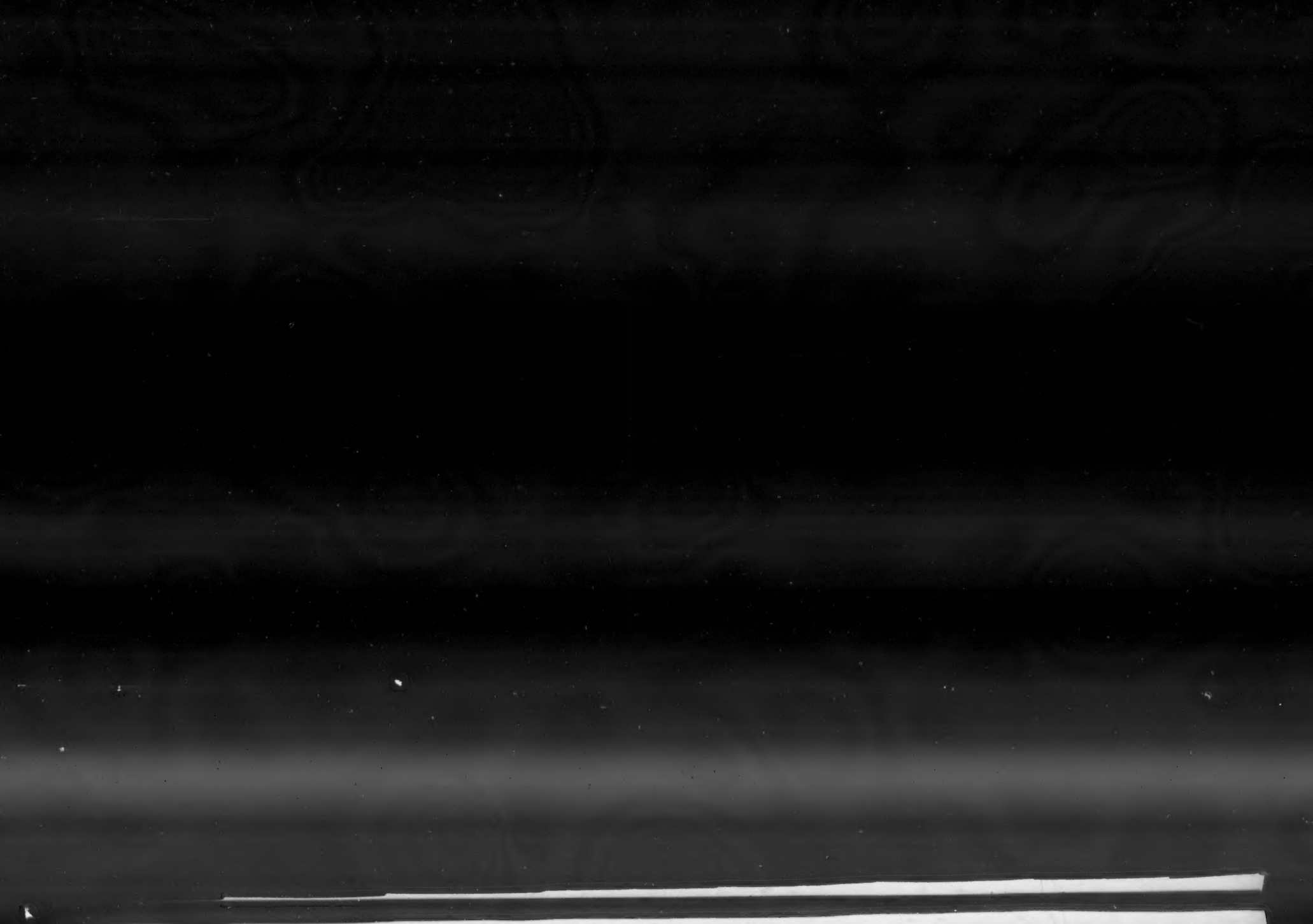
THE British and Irish Railway Undertakings and Cross Channel Shipping Companies hereby give notice that the Charges for Customs Clearance Services on traffic between places in Great Britain and places in the Republic of Ireland will be amended on and from November 1, 1960. (Details will be supplied on application.)

Foreign Employment

ROADMASTER

ENGINEERING GRADUATE preferred; minimum of two years engineering training essential.

Require two years varied railroad engineering service, or five years in direct charge of track crews. Will supervise 135 men maintaining 45 mile railroad, assign work, order materials, be responsible for safety, make regular detailed inspections of roadbed and all track on main line, sidings and yards, bridges, tunnels, etc. Will make engineering calculations relating to maintenance and use of structure and equipment. Must speak Spanish. Married or single candidates acceptable.

Excellent opportunity large copper company, Chile, South America. Two year contract with transportation both ways for you and family. Basic salary $525.00 to $650.00 per month depending upon age and experience of applicant.

Box 6, The Railway Gazette, 33 Tothill Street, S.W.1.